RAILROAD GAZETTE

FRIDAY, OCTOBER 20, 1876.

## THE UNITED STATES INTERNATIONAL EXHIBITION.

XII.

RAILROAD SIGNALS—(CONTINUED).

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The very excellent model which Messrs. Saxby & Farmer exhibit at the Centennial represents a double line junction with a road-crossing and gates for opening and closing the communication across the tracks. The model represents very perfectly all the mechanism employed in operating signals, and which was described in the *Railroad Gazette* last week. Fig. 14 represents a plan of the double-line junction represented by the model.

Before describing it, it should be explained that in England, and also to some extent here, the word "foul" is used to designate the condition of things when a train or part of a train occupies such a position on a track as to prevent another train from passing over it. Thus in fig. 14 if a train was in a position on the branch up line so as to extend across the main down line, the latter would be said to be "fouled;" or, if a train was standing or passing over switch 6 on the main up line, the branch up would be fouled.

In the plan the direction in which the trains run on each of the tracks is represented by the darts. 1 is the distant signal of the main up track, and 2 the home signal; 3 and 4 are the distant and home signal for the branch up; 9 and 11 the home and distant signal of main down line, and 10 the home signal for the branch down. In many cases one distant signal, like 11, is employed for both the main line and branch. The gates are clearly represented and swing on the path indicated by the dotted lines.

By referring to the plan it will be evident that if a down train is approaching the junction from the right on the down main line, a collision might occur at what is called the "diamond crossing," *D*, if a train were allowed at the same time to run from the branch up line to the main up line. If the switch 6 is set for the main line, of course no train could run from the main line to the branch, so that when the main down line is clear the signals 10, 3 and 4 should be set to indicate that the two branch lines are not clear. In order to make this apparent to the eye, fig. 15 has been engraved with the main down line shaded so as to indicate that it is clear and the signals shown in the position indicated. It is obvious that if no trains are allowed to run over the branches the main up line is then clear too. The signals 1 and 2 may therefore be set to indicate "line clear" as represented.

If the switch 5 is set for the up branch and 6 for the main line, as stated above, a collision might occur at the diamond crossing *D*. For this reason switches 5 and 6 are made to interlock with each other, so that switch 5 cannot be set for the branch up until *after* switch 6 is set for the branch down.

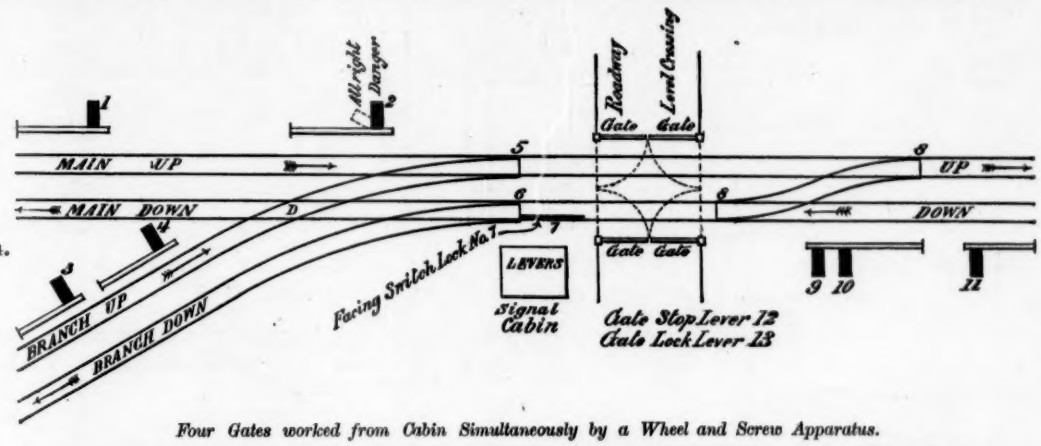
If the switch 5 is set to connect the up branch with the main line, as shown in fig. 16, then the signals 1 and 2, 11 and 9 for both tracks of the main line must be set to "danger," and 3 and 4 may be lowered to line clear; but it is evident that the trains from the up branch to the main line will not interfere with those on the main down line to the down branch, so that signal 10 in such a case may be lowered to line clear.

In fig. 17 the switch 6 is supposed to connect the main down track with the down branch. In such a case signal 9 is raised to danger and 10 may be lowered to line clear. At the same time trains may run on the main up line without interfering with those on the down main track to the down branch. Signals 1 and 2 may therefore be lowered to "line clear."

From this explanation a tolerably clear idea may be formed of the relation which the movement of the different switches and signals should bear to each other. As already stated, the interlocking apparatus provides mechanical means which makes it impossible to move the signal or switch levers excepting in the relation to each other which insures absolute safety, at least so far as that can be secured by the signals.

To explain the interlocking still further, let it be supposed that both the switches 5 and 6, fig. 14, are set for the main line and all the signals are set to danger; which, by the

Fig. 14.




*Four Gates worked from Cabin Simultaneously by a Wheel and Screw Apparatus.*

Explanation of Signals.—No. 1. Main Up Line Distant Signal. No. 2. Main Up Line Junction Signal. No. 3. Branch Up Line Distant Signal. No. 4. Branch Up Line Junction Signal. No. 9. Main Down Line Junction Signal. No. 10. Branch Down Line Junction Signal. No. 11. Down Line Distant Signal.

Fig. 15.

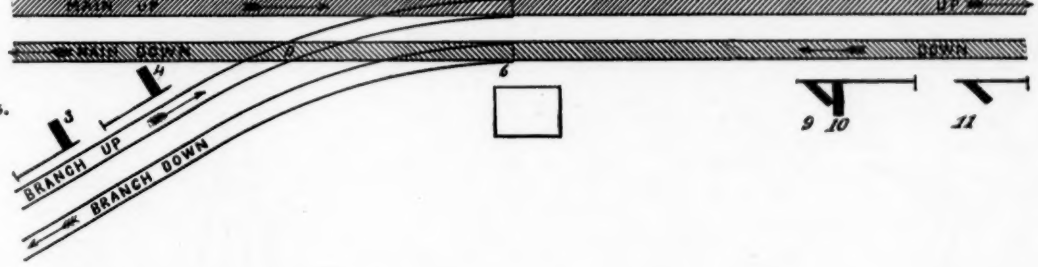



Fig. 16.

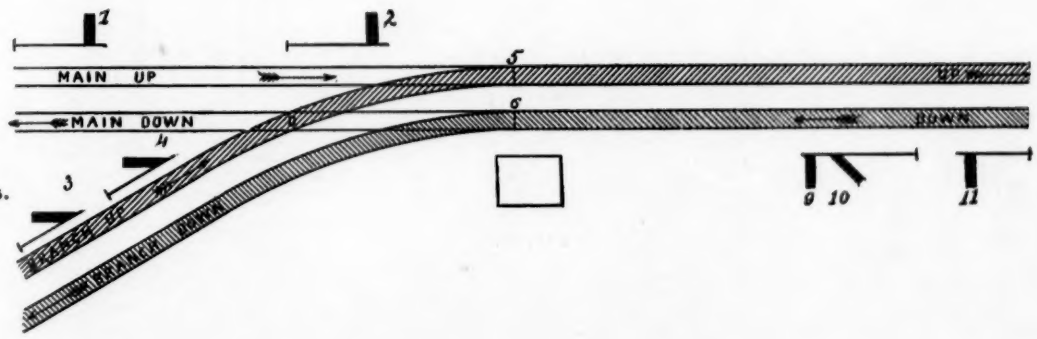
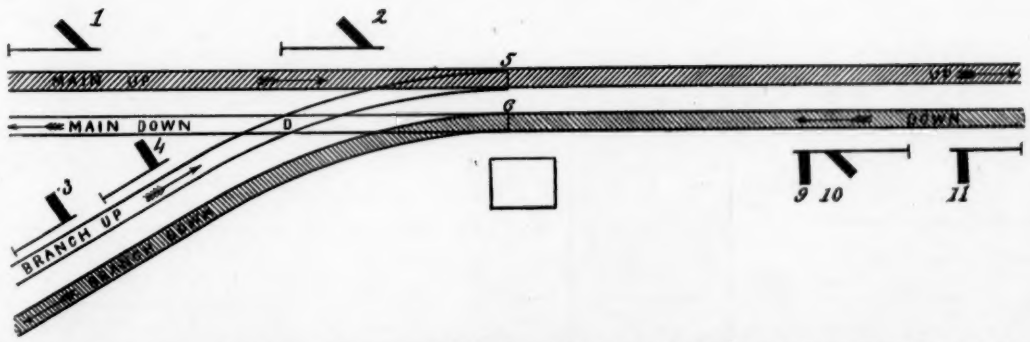



Fig. 17.




way, is the normal position of the signals at all times when no trains are passing or expected to pass the junction. If, now, we want to permit a train on the main up line to pass, the signals 2 and 1 are lowered to line clear. In doing this, signals 3 and 4 are locked at "danger," so as to make it impossible to admit a train on the branch up line. If the signals and switches are in their normal position, and we want to admit a train on the branch up, the switch 5 must first be unlocked. In doing this, the spring catch-rod of the switch locking lever must be raised out of its notch, which movement locks signals 1, 2, 3 and 4. The switch lever when it is moved back so as to open the switch to the branch also locks signals 1 and 2 and unlocks 3 and 4. The latter are, however, still locked by the switch-locking lever, and it is only when the switch is locked in its new position that the signals 3 and 4 are free to be moved. Of course,

when the locking lever is again thrown into its normal position it has unlocked signals 1 and 2, but these in the meanwhile have been locked by the movement of the switch lever. It would occupy too much time and space to explain in detail the manner in which the locking is effected in all the combinations required, even in so simple a case as that represented; nor is it necessary, as the reader, if he wishes, can easily work it out for himself. The system of interlocking can be applied to any number of lines and to any combination of switches and signals, however complicated. At some stations in England over a hundred levers are now employed.

As the levers for working a system of interlocking switches and signals must all be concentrated at one place, or in the cabin or signal-box, the signalman is necessarily placed at a considerable distance from the switches, to which and to the locking bolts the motion of the levers, as has been explained, is communicated by long iron rods and a series of bell cranks. In many cases a much more complicated system is needed than that shown is fig. 14. Fig. 18 is an example of this kind. In the language of "Barry's Railway Appliances" (from which also the paragraphs below in quotation marks are taken): "The expansion and contraction of these long rods, under the atmospheric changes of temperature to which they are exposed, produce alterations in their lengths which must be guarded against. Assuming a range of temperature of 60 degrees between a frosty night and a hot mid-day, an iron rod 300 ft. long, even if it be protected from the direct rays of the sun by wooden covers and by felt, would alter in length to the extent of about 1⅛ in. If the long rods alter in length, the switch lever may not accurately open and shut the switches. When the interlocking apparatus was first introduced, the long rods were furnished with adjusting screws, and brakemen and signalmen had continually to inspect and adjust the screws as the temperature altered. But it was soon seen that some self-acting adjustment was absolutely necessary, and the following simple plan has been adopted. The long rods are divided into approximately equal lengths, and their ends are connected to opposite ends of a short lever, *A B*, fig. 19, which is pivoted at its centre, *C*, and placed at right angles to the long rods. Thus any alteration of length in one piece of the long rod causing a movement of one end of the compensating lever in one direction is counterbalanced by the equal alteration in the length of the other part of the rod which is satisfied by the movement of the other end of the compensating lever in the opposite direction, and thus the motion of the switch lever is transmitted unaltered in amount to the switch rails."

If semaphore signals were used for switches which communicate with side or cross-over tracks, as 8, 8' in fig. 14, there would be danger of confusing them with the signals to indicate the condition of the main tracks.

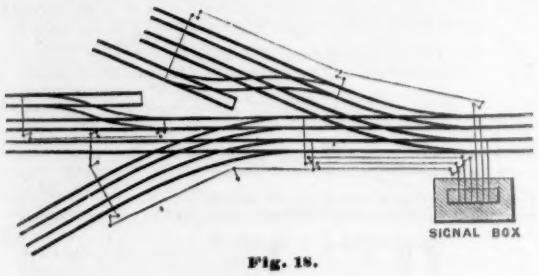



Fig. 18.

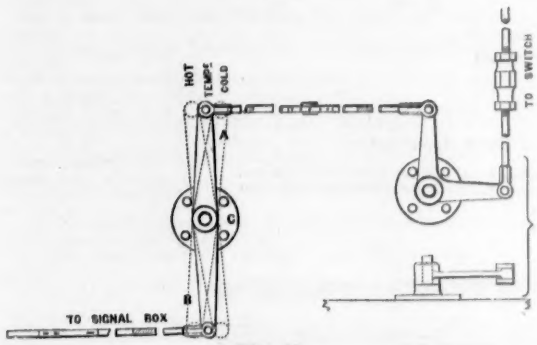



Fig. 19.

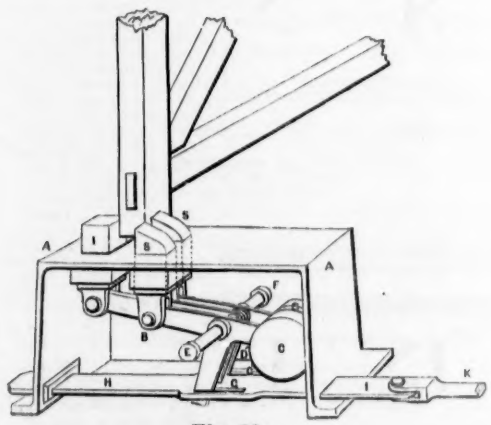


Fig. 26.

FIG. 2

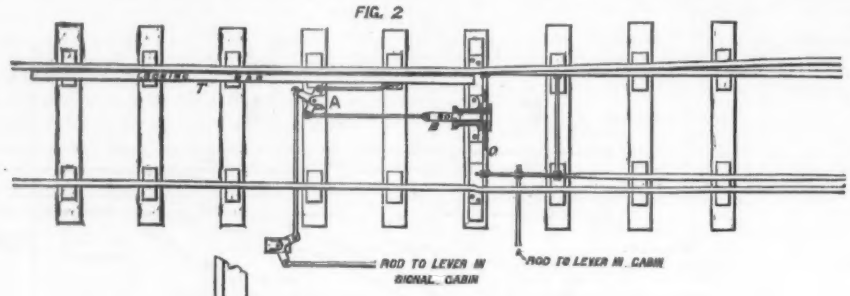
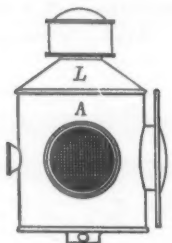
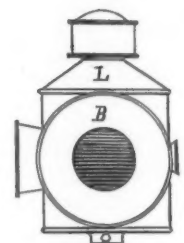


FIG. 5 FIG. 4



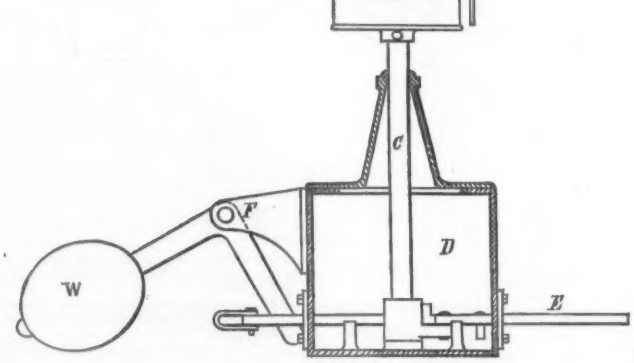




Fig. 20.

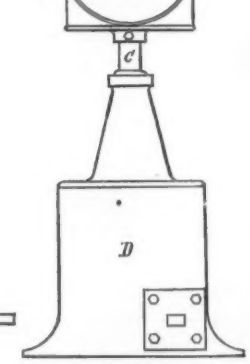



Fig. 21.

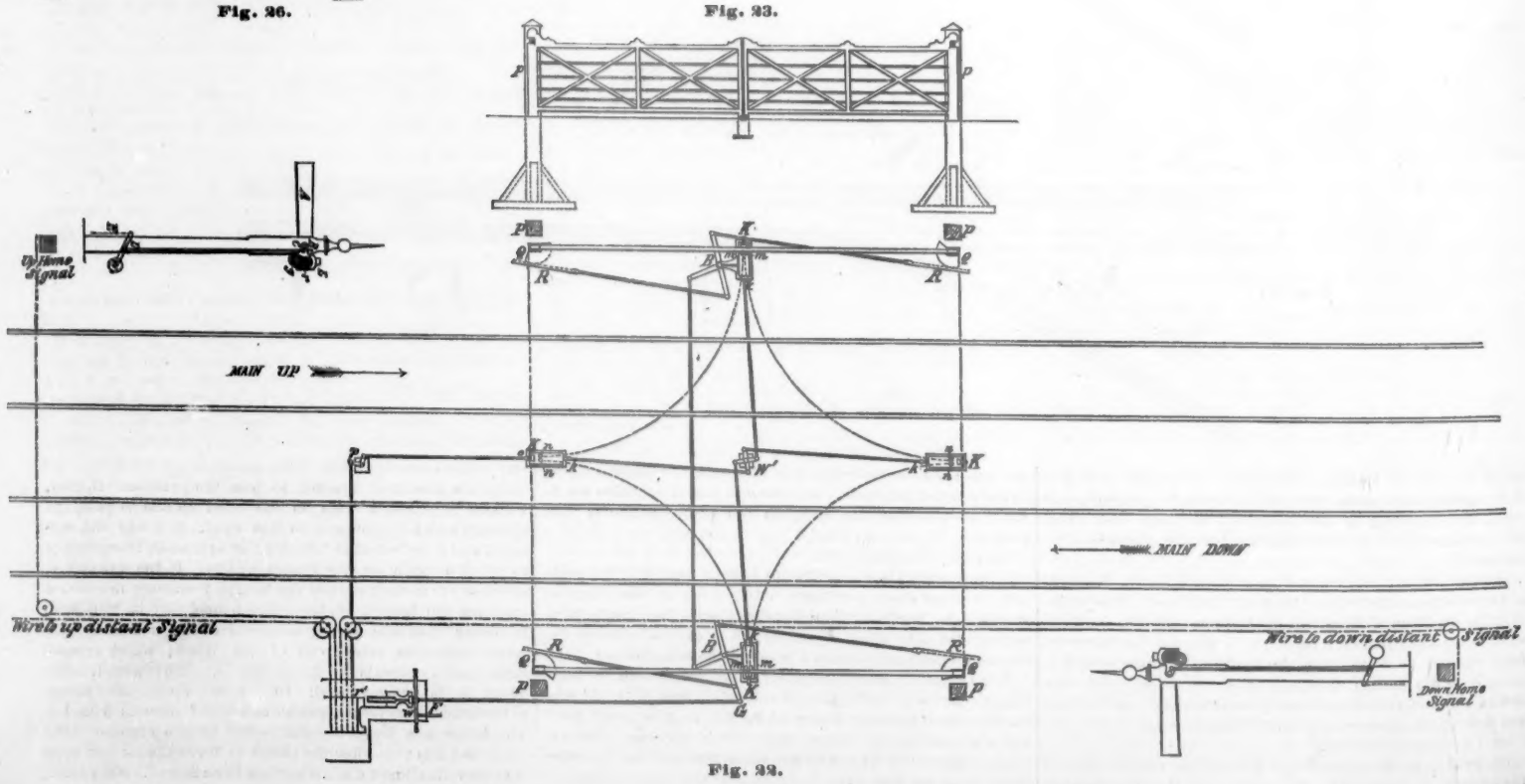



Fig. 22.

Fig. 23.

For this reason Messrs. Saxby & Farmer use what they call "ground signals," shown in two views in figs. 20 and 21. These consist of a lamp enclosed in a case, *L*, which is mounted on a rod or shaft, *C*, which is made to turn one-quarter way round like an ordinary switch target, so that in one position of the switch it shows a red light, *A*, and in the other position a green light, *B*. The shaft is attached to a cast-iron base, *D*, which contains suitable mechanism for turning the shaft by means of the rod, *E*, which is connected with the switch. The switches which connect the side tracks with the main line are made to interlock with the main line signals, so that it is impossible to open the switch to the side track or cross-over without first displaying the proper "danger" signals.

"An objection arises to the plan of working switches from a signal-box at a long distance from them, from the danger of a signalman carelessly or unwittingly moving the switch while a train is going over them; and there is also danger of a rod breaking or becoming disconnected from the switch, without the knowledge of the signalman, in which case he might move the switch lever, and so put in operation all the appropriate locking and unlocking in the apparatus, without any corresponding movement of the switches themselves having taken place. Also, there is danger with switches worked from a distance of their not being completely shut, either from want of accuracy in adjustment of the working parts, or from a stone or some like impediment finding its way between the switch and the stock rail. Such dangers were not chargeable against the old system, when switchmen stood close to the switches and had their work well in view continually, but require to be carefully guarded against now that the switches are worked from a distance.

"If, as has been explained, switches are left half open, or if while the train is passing over them the switches are moved, part of the train will go one way and part the other, the train will probably leave the line and be wrecked. The interlocking gear prevents the signal man from moving the switches while the 'all right' signal is exhibited, but it has been found more than once that a signal man has altered his signal to 'danger' while a train was passing the switch, thus unlocking the switch, and has immediately afterwards moved the switch lever and produced a disaster by 'splitting' the train, that is, sending part of it on one line and part on another. This danger is particularly to be provided against with switches placed a long way from the signal box.

"The switch-locking bar, figs. 2, 3 and 4, was designed to meet this danger of switches being moved during the passing of a train. It consists of the following simple contrivance: A bar, *T*, at least as long as the greatest distance between any two wheels of any vehicle in use on the railway, is placed at the inside of one of the rails immediately in front of the switch, and is connected with the bell crank, *A*, fig. 2, by which the locking bolt *B* is operated. The bar *T* is hinged or supported on short links, *l l*, figs. 3 and 4, so that it cannot be moved lengthways without at the same time rising. The bar is level, or nearly level, with the top of the rails when it is in the middle of its stroke, but when at the end of its stroke and the locking bolt *B*, fig. 2, is 'home' and the switch locked, the locking bar stands a few inches below the top of the rail. As the bar is longer than the greatest distance between any two wheels, it follows that from the time at which the first pair of wheels of a train comes over the bar to the time at which the last pair of wheels leaves the bar, it will be held down by the flanges of the wheels as shown in fig. 3. Consequently it is impossible, while there is a train moving over it, for the signalman to unlock the switch, and therefore he cannot move it until the last car has passed over the locking bar."

It often happens that at junctions and stations a roadway grade crossing is necessary to allow ordinary vehicles to cross over the track. Unless gates are provided to exclude vehicles when trains are approaching or passing the crossing, there is great danger of accident. In Messrs. Saxby & Farmer's model a very complete arrangement is shown for opening and closing such gates and for displaying the proper signals when the gates are opened or closed. In fig. 22 the arrangement and location of the crossing and gates are shown. Fig 23 shows an elevation of the gates and the mechanism for operating them. They are divided into two parts, which are hinged to posts, *P*, *P*, *P*, *P*. Underneath the surface of the ground toothed quadrants, *Q*, *Q*, are attached to the gates, into which racks, *R*, *R*, gear. These racks are connected by rods to T-shaped bell-cranks, *B*, *B'*, which are connected together by a rod, *B B'*. One of the bell-cranks, *B*¹, is connected by a rod, *F G*, to a lever in the signal box. This lever, *E F*, is shown in fig. 24, which represents a side view, and fig. 25 an end view of the mechanism by which the gates are opened and closed. This consists of a horizontal screw, *S*, fig. 24, to which a hand wheel *W W*, is attached. On the screw is a movable nut, *N*, which is connected by links, *E N*, with the upper end of the lever, *E F*. The lever is pivoted at *H*, and its lower end, *F*, is connected with the bell-crank, *B*¹, fig. 22, by the rod *F G*, shown in figs. 22 and 24. It is apparent that if the hand wheel *W*, fig. 24, is turned, the nut, *N*, will be moved by the screw, *S*, and its motion will be communicated to the gates, which can thus be swung open, as indicated by the dotted lines in fig. 22.

It is obvious, however, that if the gates are opened the signals on the railroad should first be raised to "danger." The mechanism by which the gates are opened is therefore made to interlock with the signal levers. At the four places, *K*, *K*, *K*, *K*, fig. 22, at which the outer ends of each pair of gates meet when closed to the roadway, and when closed to the track, what are called stop boxes, *K*, *K*, *K*, *K*, are placed. A detailed view of one of these is shown in fig. 26. They are sunk down so that the top *a a* coincides with the surface of the ground. The stops *s*, *s* and *t* hold the gates in their position when opened or closed, to prevent any one excepting the signalman from moving them. The stops *s s* are made with beveled ends like ordinary door latches, and they are connected at *b* to a T-shaped lever whose fulcrum is the shaft *e*, *f*. The T-levers are counterweighted at *C*, *C*, and their lower arms, *d*, *d*, engage in slots, *G*, *G*, in a flat plate, *H I*, which has a lateral motion and is operated by the rod *K* (also shown in fig. 22). Each of the rods *K* is connected with a four-armed bell-crank, *W*, fig. 22, in the centre between the gates. The plate in the stop box, on the left side of fig. 22, is connected by a rod, *o p*, with a bell-crank, *p*, and the latter by another rod, *p r*, with a lever in the signal box, by which all the stop plates are operated simultaneously.

By referring to fig. 26, it will be seen that if the plate *H I* were moved towards the right-hand side, it would not act on the T-lever and draw the stops *S S* down so as to release or unlock the gate. The connections which operate the stop plates are so arranged that when the stops *m*, *m* and *m*, *m*, fig. 22, are depressed, those at *n*, *n* and *n*, *n* are released and are thrown up by their counterweights.

"Supposing, then, the gates are shut against the road traffic, as shown in fig. 22, and it is necessary to open them for the road traffic and to shut them against the railway traffic, the first thing to be done, so far as moving the gates is concerned, is to depress the stops *m*, *m* and *m*, *m* by moving the stop lever; but the stop lever is so interlocked that it cannot be moved unless *all* the signals are at danger; and, further, the movement of the stop-lever locks all the signals in the position of 'danger.' The signals being placed at 'danger' the gate stops *m*, *m* and *m*, *m* are lowered, and the stops *n*, *n*, and *n*, *n* are raised by one movement of the stop lever. Then by means of the wheel and screw apparatus for operating the gates, all four gates are moved into the position shown by the dotted lines, and as they pass over the beveled ends of the stops *n n* and *n*, *n*, the latter are depressed, but as soon as the gates pass over them the stops will be thrown up by the counterweights, and will thus hold the gates fast in position across the tracks."

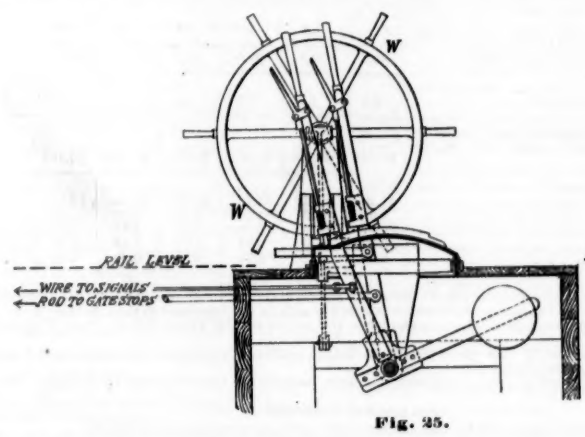



Fig. 25.

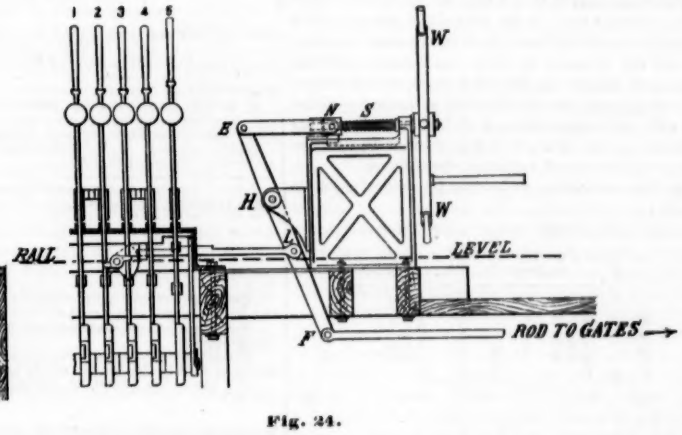



Fig. 24.

The lever *E F*, fig. 24, of the wheel and screw gear has a locking bar attacked to it at *L*, which also interlocks with the signals so that as long as the gates are open to the road traffic all the signals will be locked at danger and cannot be lowered until the gates again close the roadway. When the gates are to be returned to their first position so as to close the roadway and open the railroad tracks, the stops *n n* and *n n* are depressed by the stop lever, and *m m* and *m m* are raised. But this does not unlock the signals, which are still locked by the screw gear which operates the gate. The signals will remain locked until the gates again close the roadway. In returning to their first position they pass over the leveled edges of the stops which are thus depressed and the gates held as before.

"This or any arrangement for moving gates by a mechanism at considerable distance from them should only be applied where the signalman can from his signal-box overlook and control the road traffic, or in cases where an attendant can be stationed at the crossing for the same purpose, as otherwise there is considerable risk that the gates in swinging to and fro may come in collision with persons or vehicles crossing the line."

The interlocking apparatus of Messrs. Saxby & Farmer has been in use for nearly two years at East Newark, N. J., at the junction there of the Pennsylvania Railroad, and can be seen in operation and examined at any time. From the model of their apparatus exhibited at the Centennial, the operation of the system can be understood more readily possibly than from any printed description. An advantage which is claimed for it over some others is the facility with which the interlocking may be increased. In many localities it often becomes necessary, owing to the laying of new tracks and switches, to increase the number of levers which interlock with each other. This Messrs. Saxby & Farmer claim can readily be done, and to any extent, with their system, and without remodeling that portion of it just put down.

Their interlocking apparatus is very extensively used in Europe, both in England and the Continent; but with the exception of the one example at East Newark it is unknown in this country. It seems absolutely certain that the interlocking system will be generally used here as our lines become more crowded and business increases, and there are now, doubtless, many places here in which its use would be both cheaper and safer than the employment of the number of signalmen and switchmen needed when there is much traffic passing over a number of switches at or near one locality. The exhibit of Messrs. Saxby & Farmer is therefore worthy of careful study by railroad men.

## Contributions.

### The Justifiable Expenditure in Improvement in the Alignment of Railways.

BY A. M. WELLINGTON, C. E.

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(*Continued from Page 443.*)

REDUCTION OF RULING OR MAXIMUM GRADE (CONTINUED).

We now proceed to our third preliminary problem, viz.: the increase in operating expenses from a change in ruling grade which doubles the engine tonnage required; this being equivalent to determining what proportion of the operating expenses varies directly with the engine tonnage, the car tonnage remaining constant. This amount, multiplied by the *percentage* of increase in engine tonnage per foot of increase in the rate of any grade (given in Table D), will give the cost per foot of such change of rate.

The increase in engine tonnage, as before stated, may be either in the number or the weight of engines; usually somewhat in both but mainly in the former. We shall therefore estimate for each and take an average between them; cautioning the reader again, however, that the money values which we use throughout this paper are not to be taken as definite fixed sums, which, if they do not happen to agree with what seems a proper estimate for any particular road, therefore destroy the value of the estimates of this paper. They are such only when the cost of a train mile is in fact $1.00, as by our standard. In other cases, they are to be regarded as mere *tokens* or *ratios*, based upon the singular constancy of ratio between the direct operating expenses which holds substantially true under the most diverse circumstances, as pointed out in the first paper of this series;—but when these ratios or approximate values are multiplied by the *actual* cost of a train mile they give a close approach to absolute values for any and all roads, although one may run its trains for half the cost per train mile of another.

*The Cost of a Double Number of Engines for the Same Business.*—The cost of *fuel* would be increased in direct proportion to the number of engines, or by 100 per cent., except that—if the number of engines has been increased solely to overcome an increased resistance on the maximum grade—on the lighter grades of the line, or say for two-thirds of the whole distance, an engine would be only half loaded, and consequently should save nearly half of that portion of the cost of fuel (60 per cent. of the ordinary average consumption) which we have seen, under the head of Curvature and Rise and Fall, to vary directly with the momentary demand for power. Allowing for this exception we should have a net increase of something over 80 per cent. in the cost of fuel (100 per cent. — ⅔ of ⅓ of 60 per cent.), but as the rolling friction is probably somewhat higher *per ton* with short trains (as to which see "Note on Rolling Friction," p. 433), we may assume the increase in cost of fuel to be 90 per cent., or 9 cents. The cost of *oil waste and water, engine repairs, and train wages*, we may assume to be increased by 90 per cent. It should be 100 per cent., except that statistics clearly show that these expenses do not increase quite as rapidly as the train mileage. The cost of *maintenance of cars* would not be affected at all.

Of the expenses for *maintenance of way*, we may assume that the cost of rails (7 cents), of adjusting track (6 cents), and of maintaining the ties and road-bed (7 cents), or 20 cents in all, will vary very nearly with the engine mileage, even if the number of cars be constant. Such excess as there may be in this estimate will be made up by an increase in the items of switches, frogs and sidings (3 cents), and bridges and buildings (4 cents). Station and general expenses will remain practically unaffected.

*The cost of a double weight of engines for the same net load* is a highly uncertain problem, for which we cannot pretend to reach more than a rude approximation. The cost of *fuel* will undoubtedly be less with a single heavy engine, per car or other unit of power, than with two engines of half the size and power, probably by as much as 15 to 25 per cent. at least, which would give us say 50 per cent. increase in the cost of fuel (1.90 — 15 to 25 per cent. = 1.61 to 1.42, or 61 to 42 per cent. increase). The cost of *oil waste and water* would be perhaps 50 per cent. greater also. As to the difference in the cost of *engine repairs*, the difference in the *first cost* of light and heavy engines is at present, according to figures furnished to the writer by the Baldwin Locomotive Works, about as stated in the following table.

This is equal to a difference of about 33 per cent. in price for engines of double weight, and proportionally for less increase

of weight. Other data, of perhaps less present value, would indicate the difference to be greater, or a little over 50 per cent. We may perhaps assume 40 per cent., and this item (the cost of renewals) forms a considerable portion of what appears charged to the cost of repairs. The "Renewal Fund" system of the

| Weight of Engine. | Approximate Cost | | | Per cent. of increase in total cost. |
|---|---|---|---|---|
| | Per long ton | Per lb. | Total. | |
| 20 tons..... | $350 | 15.6 cts. | $7,000 | |
| 30 " ..... | 275 | 12.2 " | 8,250 | 17.9 |
| 40 " ..... | 230 | 10.3 " | 9,200 | 31.4 |

Philadelphia & Reading Railroad enables us to determine that on that road the cost of renewals of engines is *at least* 29.7 per cent. of the cost of repairs proper, or about 23 per cent. of "Repairs of Engines," including renewals, and very possibly more.* Of the remaining cost for "Repairs of Engines" (77 per cent. of the whole) which represents the expenditure for repairs proper; about 30 per cent. will be for wood, iron, steel, and other raw materials; 13 per cent. for wheels, axles and tires, and 57 per cent. only for labor, if we may judge by Table XIX. below. The cost of raw materials at least, and a certain portion of the cost of wheels and tires, should vary in almost direct proportion to the weight of engine, even if the cost of labor were independent of it, so that it would seem a moderate estimate that the cost of engine repairs (including, of course, renewals) is increased by about 33 per cent. for a double weight of engine.

The effect on the cost of *maintenance of track* of increasing the weight of engines is the most uncertain of all, and the writer knows of no observed facts bearing on the subject. It certainly increases in much greater ratio than the weight on the drivers, and as an estimate somewhere within gun-shot we might assume that it is approximately in proportion to the square of the weight of engine (*i. e.*, weight on drivers). For an engine of double weight, this would show that 100 per cent. additional power would be purchased at the cost of 300 per cent. increase in the cost of track maintenance per car hauled; but it would be an error to assume the percentage for so great a change in weight as a proper one for all changes. If the weight of engine be increased 10 per cent., the cost of track maintenance would be increased, under our rude assumption, *at the rate of* 210 per cent, ($1.1^2 = 1.21$, and $0.21 \times 10 = 2.10$); if it be increased 20 per cent., at the rate of 220 per cent. ($1.2^2 = 1.44$, and $0.44 \times 5 = 2.20$), etc. It is perhaps not an unfair assumption that the increase in track maintenance resulting from an increased weight on drivers is at the rate of 200 per cent. of the average cost, and that the cost of *ties and road-bed maintenance* will be in direct ratio, or at the rate of 100 per cent.; any excess in this estimate being covered by an unestimated increase in the cost of yards and structures.†

Summing up these estimates, we have as the cost of a double engine tonnage:

| Item. | Total cost. | For a double no. of engines. | | For double wt. of engines. | |
|---|---|---|---|---|---|
| | | Per cent increasing with No. | Cost. | Per cent. increasing with wgt. | Cost. |
| Fuel..... | 10 cts. | 90 p. c. | 9 cts. | 50 p. c. | 5 cts. |
| Oil, waste, etc.. | 2 " | " | } 21 " | " " | 1 " |
| Engine rep'rs.. | 9 " | " | | 33 " | 3 " |
| Train wages.... | 12 " | " | | unaffected. | ..... |
| Track rep'rs.... | 13 " | 100 p. c. | 13 " | 200 p. c. | 26 " |
| Road bed rep'rs | 7 " | " | 7 " | 100 " | 7 " |
| Yards & struct's | 7 " | {includ'd above.} | ..... | {included above.} | ..... |
| Gen. & stat'n.. | 30 " | unaffected. | ..... | unaffected. | ..... |
| Totals..... | $1 00 | 50 per cent. | 50 cts. | 42 p. c. | 42 cts. |

Assumed average, 48 cents per train mile, or 48 per cent. of operating expenses.

As an average between these two estimates, we may assume that the cost of so increasing any grade that a double engine tonnage will be required for the same business is 48 cents *per train mile required for a given business on the given grade.* Or, to express the same fact differently, 48 per cent. of the total operating expenses varies directly with the engine tonnage, the car tonnage remaining constant.

Assuming, then, an average of 48 cents per train mile, and multiplying by 325 for the number of yearly trips, and by 2 for the round trip, we have

$$\$.48 \times 325 \times 2 = \$312.00$$

as the yearly cost, *per daily train, per mile of road*, of increasing any ruling grade till the net load of the engine is reduced one-half. If, now, we multiply this sum by the *percentage* of increase in engine tonnage, resulting from an increase of ONE FOOT in any ruling grade, we shall obtain the cost per daily train per mile of road of such increase.

This cost, however, is not an absolute value independent of the length of the road, as in the case of the similar values deduced for distance, curvature, and rise and fall, but varies with it, inasmuch as the ruling grade increases the expense of operating the entire road, whatever its own length may be. Hence, to obtain the true value of reducing grade, it must be multiplied by the length of the road, since it is obvious that the justifiable expenditure to reduce grade will be twice as great on a road of 100 miles long as on a road of 50 miles long. We have made up Table E below for a road of 100 miles long as a convenient unit—equally so with one mile for the determination of values for any length of road, and giving at a casual glance a fairer comparison of the value of reducing grade with improvements in the other details of alignment. Table E embodies the final results we have been seeking, and its construction will now be sufficiently clear by an examination of the table itself.

* The "Renewal Fund" of the Philadelphia & Reading Railroad is formed by a direct tax of 5 cents per 100 ton miles, which does not appear in the returned "total expenses," as before stated, and appears to be expended—first, in making good the whole cost of new iron and bridges, and what is then left of it on rolling stock and structures. As it does not begin to cover the cost of car renewals, however (the returned expenditures for "renewals" being, for the four years—1869-73-74-75—only 4.4 per cent. of car repairs), it is uncertain how great a proportion of the *locomotive* renewals also is included in repairs. The *returned* cost of locomotive renewals is 29.7 per cent. of the returned cost of repairs, or about 22.8 per cent. of the total of renewals and repairs, as shown in Table XIX.

† The authority by which we assume that the cost of road-bed repairs does in fact vary very nearly with the engine tonnage is given at length in the first paper of this series. The writer is well aware that it may appear excessive to many readers.

## TABLE E.

SHOWING THE CAPITALIZED VALUE PER DAILY TRAIN OF AVOIDING AN ADDITION OF ONE FOOT TO THE RULING GRADE. TABULATED FOR A ROAD 100 MILES IN LENGTH. REDUCE OR INCREASE IN PROPORTION TO LENGTH OF ROAD OR DIVISION. (Cost per train mile assumed at $1.00.)

| Rate of maximum grade in feet per mile..... | LEVEL. | 10 | 20 | 30 | 40 | 50 | 60 | 80 | 100 | 150 |
|---|---|---|---|---|---|---|---|---|---|---|
| Percentage of increase in engine tonnage, for each foot of increase in rate of grade (from Table D).. | 4.0 | 3.1 | 2.4 | 2.0 | 1.7 | 1.5 | 1.4 | 1.2 | 1.1 | 0.9 |
| COST PER YEAR OF ONE FOOT INCREASE IN RATE OF GRADE = $312.00 × 100 miles × per centage in line above..... | $1,248 00 | $967 20 | $748 80 | $624 00 | $530 40 | $468 00 | $436 80 | $374 40 | $343 20 | $280 80 |
| CAPITALIZED VALUE. | | | | | | | | | | |
| Rate of interest, 5 per cent..... | $24,960 | $19,344 | $14,976 | $12,480 | $10,608 | $9,360 | $8,736 | $7,488 | $6,864 | $5,616 |
| Rate of interest, 6 per cent..... | 20,800 | 16,120 | 12,480 | 10,400 | 8,840 | 7,800 | 7,280 | 6,240 | 5,720 | 4,680 |
| Rate of interest, 7 per cent..... | 17,830 | 13,817 | 10,697 | 8,914 | 7,577 | 6,686 | 6,240 | 5,349 | 4,903 | 4,011 |
| Rate of interest, 8 per cent..... | 15,600 | 12,090 | 9,360 | 7,800 | 6,630 | 5,850 | 5,460 | 4,230 | 4,290 | 3,510 |
| Rate of interest, 10 per cent..... | 12,480 | 9,672 | 7,488 | 6,240 | 5,304 | 4,680 | 4,368 | 3,744 | 3,432 | 2,808 |
| RELATIVE NUMBER OF TRAINS (or engine tonnage) required for same business..... | 1.00 | 1.41 | 1.83 | 2.27 | 2.73 | 3.21 | 3.72 | 4.80 | 5.96 | 9.56 |
| RELATIVE NET LOAD per engine ton ..... | 1.00 | 0.711 | 0.546 | 0.440 | 0.365 | 0.311 | 0.269 | 0.208 | 0.168 | 0.105 |

REMARKS.—If the cost per train mile be higher or lower than $1.00, multiply the values above by the actual or assumed cost. Multiply also by the length of the road ÷ 100; and by the number of feet per mile in the proposed change of rate.

For an original rate of grade intermediate between those given in the table, the proper tabular values will be given, very nearly, by proportional interpolation—*e. g.*: Value of avoiding 1 foot per mile addition to a 15-feet grade, at 6 per cent. ($16,120 + $12,480) ÷ 2 = $14,300. True value: $312.00 × 100 × .027 = $842.40 ÷ .06 = $14,060.

For values PER $1,000 OF AVERAGE ANNUAL TOTAL EXPENSES PER MILE, increase the tabular values by one-half. (More exactly, multiply by 1.54.)

FOR ROADS IN OPERATION:

Tabular values *per* $100,000 *of average annual expenditures* on the given line or division, for various items, will be given as follows, and will be independent of the length:

| Multiplying the tabular values above by | will give corresponding values, *per* $100,000 *of average annual expenditure*, for |
|---|---|
| 1.5 | TOTAL EXPENSES. |
| 2.2 | "Line" or "Transportation" expenses. |
| 3.2 | Maintenance of Way and Works, Repairs Engines, Fuel, Oil, etc. |
| 2.8 | Main. of Way and Works and "Motive Power" (same as above + engine wages). |

This table is nearly independent of the pattern of engines, ratio of adhesion, rolling friction, or extent of the change of grade. The percentages of extreme error are the same as for Table D, which see.

## TABLE F.

SHOWING THE CAPITALIZED VALUE PER LOADED CAR (20 tons) OF AVOIDING AN ADDITION OF ONE FOOT TO THE RULING GRADE. TABULATED FOR A ROAD 100 MILES IN LENGTH. REDUCE OR INCREASE IN PROPORTION TO LENGTH OF ROAD OR DIVISION. Cost per train mile assumed at $1.00.

| Rate of Maximum Grade in feet per mile..... | LEVEL. | 20 | 40 | 60 | 80 | 100 | 120 | 150 | 200 |
|---|---|---|---|---|---|---|---|---|---|
| No. of cars to a train, assuming 60 as the level load..... | 60.0 | 32.8 | 22.0 | 16.2 | 12.5 | 10.0 | 8.3 | 6.3 | 4.2 |
| PERCENTAGE OF INCREASE IN ENGINE TONNAGE, for each foot of increase in rate of grade (from Table D)..... | 4.0 | 2.4 | 1.7 | 1.4 | 1.2 | 1.1 | 1.0 | 0.9 | 0.8 |
| COST PER CAR HAULED OF ONE FOOT INCREASE IN RATE OF GRADE; = $0.48 × 2 × 100 miles × percentage in line above ÷ No. cars per train ..... | $0.064 | $0.070 | $0.074 | $0.083 | $0.092 | $0.105 | $0.116 | $0.137 | $0.183 |
| CAPITALIZED VALUES. | | | | | | | | | |
| Rate of interest, 5 per cent..... | $1.28 | $1.40 | $1.48 | $1.66 | $1.84 | $2.10 | $2.32 | $2.74 | $3.66 |
| " " " 6 " " ..... | 1.07 | 1.17 | 1.23 | 1.38 | 1.53 | 1.75 | 1.93 | 2.28 | 3.05 |
| " " " 7 " " ..... | 0.91 | 1.00 | 1.06 | 1.19 | 1.31 | 1.50 | 1.66 | 1.96 | 2.61 |
| " " " 8 " " ..... | 0.80 | 0.87 | 0.93 | 1.04 | 1.15 | 1.31 | 1.45 | 1.71 | 2.29 |
| " " " 10 " " ..... | 0.64 | 0.70 | 0.74 | 0.83 | 0.92 | 1.05 | 1.16 | 1.37 | 1.83 |

REMARKS.—If the cost per train mile be higher or lower than $1.00, multiply the values above by the actual or assumed cost. Multiply also by the length of the road divided by 100 and by the number of feet per mile in the proposed change of rate.

For a rate of grade intermediate between those given in the table, the proper tabular values will be given, very nearly, by proportional interpolation.

The table is calculated by an engine of 60 tons gross weight, including tender. For lighter engines the tabular values should be increased by 5 to 10 per cent. per 10 tons less weight.

For values PER $1,000 OF AVERAGE ANNUAL TOTAL EXPENSES PER MILE increase the tabular values by one-half. (More exactly, multiply by 1.54.)

FOR ROADS IN OPERATION

Multiply the tabular values by the same coefficients for various items of expense as given beneath Table E.

This table is nearly independent of the *extent* of the change in grade. The percentages of errors are the same as for Table D, which see. It is absolutely independent of the *rolling friction*, provided the assumed net load on a level be changed in proportion thereto. It is very nearly independent of the *pattern of engine and ratio of adhesion*. For the "Consolidation" pattern (or any engine weighing only 8 times the tractive power) decrease the values for a 60 feet grade 10 per cent., and grades of 100 feet and over 17 to 20 per cent. For the "American standard" pattern (or any engine weighing 12 times the tractive power) increase in the same proportion. This is assuming the net load on a level to be 60 cars in each case. If less or greater, the tabular values will be changed in the same proportion.

## THE PROPORTION OF BUSINESS AFFECTED BY A REDUCTION OF RULING GRADE.

It is very evident that inasmuch as the objection to high rates of grade lies solely in their effect as a limiting agent to the weight of trains, Table D cannot be applied indiscriminately to all trains run over the line, but only to such trains as it does *in fact* so limit. This, on a new road, might sometimes exclude *all* trains, and it would probably exclude a considerable proportion of all the passenger trains of the United States, which on a majority of railways habitually "run light." But as a railway is located once for all, Table E might perhaps be properly considered as applying to all freight trains, and in these days of increasing luxury of travel, to most passenger trains also, independent of the following important fact, which is often forgotten or neglected, viz., that, except for the grade, the weight of engine may be less for *all* trains, whether they commonly "run light" or not. Engines must always be heavier than is *ordinarily* required, to provide for occasional demands, and a reduction of ruling grade may properly be considered as reducing *pro rata* the necessary and advisable weight of engines, even for light trains. For it is certain that a 30-ton engine will haul no greater net load on a 60-feet grade than a 26-ton engine will haul on a 50-feet grade or a 22-ton engine on a 40-feet grade, and *whatever* may be the margin deemed proper as an allowance for emergencies or future increase of business, it must *always* be proper to reduce the engine tonnage in corresponding proportion; and hence a reduction of ruling grade has a positive and present cash value, even if every train upon the road will habitually be "run light" for an indefinite number of years. That this reduction is *not* made, and that, on many low-grade railways, locomotives of equal weight and power with those on lines opposing more than double the resistance are hammering out the track to no purpose whatever, is not the fault of the constructing engineer, nor is it good practice for him to adjust his alignment on the hypothesis of an error of judgment in those who succeed him.

On account of these facts, and of the grave disadvantages which are liable to arise at any time from an irremediable limitation of capacity, and also because a varying but usually important increase in way receipts is derived from additional *length*, but never from heavier gradients, the writer suggests that no more than due weight is given to the value of low grades if it be considered as applying to all trains alike—at least in original location and for the purpose of comparison with the value of improvements in the other details of alignment. In the case of projected improvements for railways already in operation and fully equipped with rolling stock, the case may be somewhat different.

Table D *apparently* indicates that the value of reducing the ruling grade decreases as the grade is higher. This is true, however, only *per train*, and is because *the number* of trains required to do a given business is greatly increased by heavy grades; or, more exactly speaking, because the *relative* net load decreases less rapidly on higher grades. For example, it will be seen, by referring to Table XVII., that an increase of 24 feet from a level grade halves the net load of the engine, while it requires an increase of 57 feet from a 50 feet grade to do the same. The reverse is the case, however, with respect to the COST PER LOADED CAR, which is the true ultimate measure of the cost of high gradients—the value per daily train being merely for *convenience* and to afford a uniform basis of comparison with the value of other improvements in alignment. The cost of increasing grades per loaded car is considerably greater as the grade is higher, because on the higher grades the cost of the constant addition to the engine tonnage which is necessitated by a given increase in grade is distributed among a less number of cars. Tables D and E furnish us a ready mode of approximating to the value per loaded car of reducing grade, as follows:

VALUE OF REDUCING THE MAXIMUM GRADE PER LOADED CAR.—We will assume, in order to err on the safe side, that an average engine will weigh as much as 60 tons including tender, and haul as many as 60 loaded cars on a straight and level track. Mr. A. J. Cassatt, Vice-President and late General Manager of the Pennsylvania Railroad, reported to Mr. Herman Haupt that the average load for a 63-ton engine is only 50 cars on a level on that road; but this is probably owing to the limiting effect of curvature, as the rolling friction deduced from the loads on higher gradients reported by him would indicate a level load of from 60 to 65 cars. A table prepared by Mr. J. Dutton Steele, late Chief Engineer of the Philadelphia & Reading Railroad, indicates that a 43¼ ton engine will haul only 38 cars on a level. Mr. B. H. Latrobe's estimate before referred to for the Portland & Ogdensburg Railroad would indicate that a 65 ton engine, 42 tons on drivers, will haul only 40 loaded cars on a level. But this is assuming only 1-7 adhesion, an assumption on which we have already commented. Assuming 1-5 adhesion, it would haul 70 cars, a little over one car per ton of engine *

Assuming then 60 cars as the level load, Table XX. shows the corresponding number of cars to a train on different grades. This is computed directly from the column of net loads given in Table XVII. by first determining the percentage of the net load on each grade to the level load and then multiplying this percentage by the assumed level load, and it is evident that the numbers thus obtained are *relatively* correct, whatever may be the number hauled on a level. If the number be assumed to be greater or less for the same engine, the values obtained per car load will be in inverse ratio to the level load. If, however, the level load be less on account of a difference in the weight of engine, the effect upon the value of reducing grade is less important, since the use of engines of great weight is very nearly as expensive as a corresponding increase in their number.

Given then the number of cars to a train on each grade, we have already estimated that the cost per train mile for the items effected by an increase of ruling grade is 48 cents, or $96 per round trip of 100 miles. We also have in Tables D and E the percentage of increase in motive power which results from an increase of one foot in the ruling grade. Then,

$$\left\{\frac{\$96}{\text{No. of cars to a train}} \times \text{per cent. of increase of motive power per foot added to the grade}\right\} =$$

the COST PER CAR-LOAD of one foot increase in ruling grade as given in Table F. This cost, divided by the rate of interest, gives the corresponding capitalized values.†

If it is desired to compare Tables E and F, the tabular values of Table F, × the number of cars to a train, × 325, for the number of days in the year, will give the corresponding values per daily train in Table E, as it is evident they should do. Any difference will be due to error from neglected decimals.

It will be seen that we have not considered passenger business in this estimate per car-load, although for reasons already given it appears to the writer that in most cases it should be so included. The weight of an ordinary passenger car for 60 persons is about 19 tons empty and 4 tons for a full load of passengers. Many sleeping cars weigh 30 and 40 tons. It would seem a very moderate estimate to consider the cost of an increase of grade per passenger car as equal to twice that per freight car, if not 2½ or 3 times.

*The basis for all these statements will be found in the Appendices to Vose's "Manual for Railroad Engineers."

† At this point we deem it proper to point out an error in a paper by J. G. Clarke, C. E., "on the Approximate Value of a Reduction of Ruling or Maximum Grade," stated to be based on data furnished by the late Charles Elliet. (See Trans. Am. Soc. Civ. Engrs., Apr., 1874. Also Van Nostrand's Magazine, vol. x., p. 37.) In so doing we disclaim once for all any intention or desire to pick flaws in the work of others, but deem it an equally essential part of a discussion of this kind to point out the grounds for any important differences from previous estimates of equal or greater authority, without forcing upon the reader the necessity of a special investigation for an intelligent decision. Mr. Clarke deduces in a very simple manner the following short and convenient formula: Letting $s$ and $s'$ = the new and old rates of grade, $W$ = the gross tonnage annually up the maximum grade, and $T$ = the gross load an engine can draw on a level; the cost per mile of road of any change in the rate of any grade

$$= \frac{s'-s}{207} W$$

Reduced to its lowest terms and dropping the algebraic nomenclature, this formula is equivalent to saying that the yearly cost of one foot increase or decrease in the rate of any grade is equal, in dollars per mile of road, to 1-20 of the number of trains necessary to haul the given business on a level; or, for a road 100 miles long, to *five times* the number of trains necessary on a level.

In this form it is somewhat easier to see that Mr. Clarke's formula is based upon a plausible fallacy, which consists in the *practical* assumption that because the value of reducing any two grades, say 20 and 40 feet, to a level is very nearly as the number of feet per mile reduced, *therefore* the value of reducing by the same number of feet any other two grades, say 40 and 60 feet to 20 feet, is not only as the number of feet of reduction as before, but is also the same in amount; whereas it increases considerably as the grades are higher, as is evident in Table F. We can show this also by a numerical illustration based upon the data of Mr. Clarke's own example, as follows:

| Grades in feet per mile. | No. of loaded cars to a train, by Col. Seymour's table. | Corresponding No. of yearly trains required to move 11,250 car-loads of 10 tons each. | Cost per no. per mile of line at 80 cents per mile round trip. | Increase in Cost on a grade 10 feet higher. | Do. capitalized at 7 per cent. = value per mile of 10 ft. reduct'n in grade. | Correspond'g value of 10 ft. reduction for a road 145 miles long. |
|---|---|---|---|---|---|---|
| 30 | 30 5 | 370 | $296 00 | $64 80 | $925 70 | $134,226 |
| 40 | 25. | 451 | 360 80 | 79 20 | 1,131 40 | 164,083 |
| 50 | 20.5 | 550 | 440 00 | 89 60 | 1,280 00 | 185,600 |
| 60 | 17. | 662 | 529 60 | 70 40 | 1,005 70 | 145,827 |
| 70 | 15. | 752 | 601 60 | 92 80 | 1,325 70 | 192,226 |
| 80 | 13. | 868 | 694 40 | ..... | ..... | ..... |
| By Mr. Clarke's formula, we obtain a UNIFORM value for a 10 feet change in any grade of ..... | | | | $60 00 | $857 14 | $124,285 |

The latter value is correct for changes from a *level* grade (according to Mr. Clarke's premises), but for no other. It is about 20 per cent. less than the values given in Table F. for changes in a level grade, owing solely to the fact that Mr. Clarke assumes that the cost of additional engine tonnage is only 40 cents instead of 48 cents. On this and one or two other minor matters we need not stop to comment.

AS A PRACTICAL EXAMPLE OF THE USE OF TABLES E AND F: By the Report of the Pennsylvania Railroad for last year, 1875, the movement of loaded cars between Pittsburgh and Altoona was about 255,000 eastward and about 85,000 westward, the remaining 170,000 cars returning empty. The average number of cars to a train on that division, coming east, is reported to be from 16 to 17, which would give the number of daily freight trains on that division as about 47. The distance is 118.3 miles, and includes the heaviest grades on the road, viz., 95 feet per mile going west from Altoona, for a distance of about 12 miles, and 53 feet per mile for the remainder of the distance. The maximum grade coming east is at several points 53 feet per mile. Assuming for the present that the latter is, independently of the use of assistant engines, a ruling grade which fixes the weight of trains, what would be the justifiable expenditure to render the 53 feet grade to the rate of 50 feet per mile, at 6 per cent. interest for capital?

By the *loaded car* standard, Table F, we have, interpolating the proper tabular value for 53 feet between the values given for 40 and 60 feet,

$1.33 ($1.38—.05) × 255,000 × 3 = $1,017,450, for a line 100 miles long and $1,017,450 × 1.183 for a line 118.3 miles long = $1,203,643.

By the *daily train* standard, Table E, we have, interpolating as before the proper value for a grade of 53 feet, between the values for 40 and 50 feet,

$7,644 ($7,800—$156.) × 47 × 3 = $1,077,804 for a line 100 miles long and $1,077,804 × 1.183 = for a line 118.3 miles long, $1,275,042.

The latter estimate is about $72,000, or 6 per cent., greater than the former. This is partly owing to neglect of decimals in several places in computing the tables, but mainly to the fact that Table F is computed on the assumption of 18 cars to a train on a 53 feet grade, while in fact on the Pennsylvania Railroad it is only 16 or 17. This increases the number of trains required, and hence makes our estimate per car unduly low. As the average cost of a train mile on the Pennsylvania Railroad is slightly over $1, we may conclude that $1,300,000 is very near to what would be the present value to the road, taking into account freight business only, of reducing their 53 feet grades to 50 feet; except for the fact that it is the 95 feet grade going west and not the 53 feet grade coming east, which is really the ruling grade, independent of the use of assistant engines. This brings up another very important subject connected with gradients, viz., the proper balance of ruling grades for, an unequal traffic.

TABLE XIX.

*Showing the Relative Cost of Renewals and Repairs of Engines, and the Relative Cost of Labor and Material for Repairs of Engines and Cars, on the Philadelphia & Reading Railroad, for a series of years.*

| Year. | Relative cost of renewals and repairs of engines. | | | Relative cost of labor, raw material, and wheels, axles and tires, for repairs of engines and cars, renewals not included. | | | |
|---|---|---|---|---|---|---|---|
| | Renewals. | Rep'rs proper | Total of renewals and repairs. | Labor. | Raw material. | Wheels, axles and tires. | Total. |
| 1869 | 26.1 | 73.9 | 100. | 57.3 | 30.6 | 12.1 | 100 |
| 1873 | 16.9 | 83.1 | 100. | 54.9 | 31.3 | 13.8 | 100 |
| 1874 | 28.0 | 72.0 | 100. | 56.3 | 30.0 | 13.7 | 100 |
| 1875 | 20.0 | 80.0 | 100. | 58.1 | 28.5 | 13.4 | 100 |
| Average | 22.8 | 77.2 | 100. | 56.7 | 30 1 | 13.2 | 100 |

| | | Average No. of engin's. |
|---|---|---|
| Total yearly cost per engine on Philadelphia & Reading Railroad for repairs proper | $1,239 | |
| Total yearly cost per engine on Philadelphia & Reading Railroad for renewals | 370 | |
| Total yearly cost per engine for "repairs of engines" as ordinarily understood | $1,609 | 378 |
| Average of 1872-3-4 & 5: Total yearly cost per engine for "repairs of engines" on Penna. R.R. and branches | 1,517 | 594½ |
| Average of 1872-3-4 & 5: Total yearly cost per engine for "repairs of engines" on Phila. & Erie R. R. | 1,333 | 147 |
| Average of 1872-3-4 & 5: Total yearly cost per engine for "repairs of engines" on Un. R. R of N. J. | 1,300 | 231½ |

REMARK.—The yearly cost of repairs *per engine* must not be confounded with the cost of repairs per train mile. The relative economy of the various railroads above in the latter respect would be in nearly inverse order to that shown in the cost of repairs per engine.

TABLE XX.

*Showing the Percentage of the Net Load on different grades to the net load on a level, and the corresponding number of cars to a train, according to the average experience of American railways, as shown in Tables XV., XVI. and XVII.*

| *Grade* in feet per mile. | Net Wt. of train per ton of tractive power. | Per cent. of net load to load on a level. | No. of loaded cars to a train, assuming 60 as the level load. |
|---|---|---|---|
| Level. | 190. | 100. | 60.0 |
| 20 | 103.8 | 54.6 | 32.8 |
| 30 | 83.6 | 44.0 | 26.4 |
| 40 | 69.5 | 36.6 | 22.0 |
| 50 | 59.1 | 31.1 | 18.7 |
| 60 | 51.1 | 27 0 | 16.2 |
| 70 | 44.8 | 23.6 | 14.2 |
| 80 | 39.6 | 20.8 | 12.5 |
| 90 | 35.4 | 18.6 | 11.2 |
| 100 | 31.8 | 16.7 | 10.0 |
| 110 | 28.7 | 15. | 9.0 |
| 120 | 26.1 | 13.8 | 8.3 |
| 130 | 23 8 | 12.4 | 7.4 |
| 140 | 21.7 | 11.4 | 6.8 |
| 150 | 19.9 | 10.5 | 6.3 |
| 175 | 16.2 | 8.5 | 5.1 |
| 200 | 13.3 | 7.0 | 4.2 |

## The Metre Gauge in India.

No. 47 EXCHANGE PLACE, NEW YORK, Oct. 11, 1876.

TO THE EDITOR OF THE RAILROAD GAZETTE:

It has been reported to me that some of the advocates of the narrow-gauge railway system and an officer holding a position in the Government of India had, on seeing some extracts from a letter published in your journal above my name, and headed, "The Metre Gauge Railway in India," expressed a belief that the greater part of the extracts were "forgeries." As this is a grave charge to make, and may be believed by some unless refuted, I send to you the original of the letter I quoted from. You will see that it contains all that was printed, and also that the author was clearly more emphatic in his expressions and denunciation of the whole system of narrow-gauge railways than I thought proper to place before the public.

W. W. EVANS.

## The Manufacture and Wear of Car-Wheels.

*The Louisville Car-Wheel and Railway Supply Company,*
LOUISVILLE, Ky., Oct. 7, 1876.

TO THE EDITOR OF THE RAILROAD GAZETTE:

Some weeks since a communication was sent to you from this office upon the subject of guarantee and wear of car wheels, but being so much condensed it was, I fear, in a measure unintelligible.

The amount of money spent in car and engine wheels is one of the large items of expense in the running of a railroad, and any percentage of excellence, however small, would consequently make a large saving.

Comparatively few of the railroad companies keep an accurate account of the mileage, and they are not fully aware of the immense difference in the wear of wheels.

We give a minimum guarantee of 50,000 miles on each wheel. That is, if any wheel should make less than the 50,000 miles, we refund in money the proportion of shortage, and should they make more mileage than that amount, the railroad companies get the benefit of it.

A wheel has to the purchaser two values, viz.: one as scrap iron and the other for the service to be obtained from it. I will use figures to illustrate. A 33-in. wheel weighing 500 lbs. is sold for say $14. This wheel is worth then say $5 as scrap, which would leave $9 as the amount paid for its mileage value; and as the wheel is guaranteed to run 50,000 miles, he would pay for its service at the rate of 18 cents per thousand miles. Should the wheel run only 42,000 miles, we would refund for 8,000 miles, or $1.44.

The 42,000-mile wheel would then have net the purchaser $12.56.

But a great many of the wheels sold for the single merit of cheapness do not make over 35,000 miles, which at the same ratio of 18 cents per thousand would give the mileage value to be $6.30, and counting scrap value as the same we have a total value of $11.30. But the 50,000-mile wheel is cheaper at $14 than the 35,000-mile wheel at $11.30, for the reasons that, being made of better material, it is safer, and less time of the car is lost in being in the shop for repairs—an item the value of which it is hard to estimate. There is another very important consideration: a responsible manufacturer who is willing to give such a guarantee must expect and calculate upon a very large majority of his wheels making over the 50,000 miles, which, we are glad to say, has been our experience. We are preparing a few tables of authenticated mileage reports, and if they would be of any interest to your readers, would be pleased to send them to you for publication. Our wheels have given extraordinary mileage, but I prefer to have the statement made by the proper railroad officials as a fact than to make any statement of my own, which might be considered as a brag. Our mode of making good a guarantee is, I believe, original, and the fairest way for both parties.

You were kind enough in your editorial notice of our last communication to express some interest in the kind of metal used in the manufacture of our wheels. We have not confined ourselves to the exclusive use of any particular brand of iron, but have tried all of the first-class irons in the United States and are led to the conclusion that the Red River iron of Kentucky, mixed with best Hanging Rock and Southern iron is the best, making a wheel with good chill but without "chill checking," with centre very strong and hub soft and easily bored.

There is undoubtedly a very great difference in the wear of the chill of different irons. This quality the Red River iron possesses to a wonderful degree. We make this statement not only from own experience, but from the result of tests made by other parties. Mr. J. C. McMullin, General Superintendent of the Chicago & Alton Railroad, had a few rails rolled with Red River as a top iron. These rails were placed in a portion of their track, in almost constant use. The result was that Red River rail lasted from four to five times as long as the ordinary iron rail in use on the opposite side of same track.

From the same ladle and for each wheel we cast a section of the tread of a wheel, and this when broken gives a very clear idea of the depth of chill in the wheel. When this is found to be insufficient, the wheel is broken and remelted.

We also cast each day bars one inch square, which are suspended on bearings 4 feet apart and broken with weights suspended from the centre. These bars stand from 700 to 900 lbs. before breaking. We have one in the office which was left for six weeks carrying 930 lbs. without breaking. This statement will seem almost incredible to your English readers, as I believe their best iron will carry only about 400 lbs.

In conclusion I would strongly urge upon railroad managers to have kept an accurate account of the mileage of their wheels. For then will each manufacturer stand upon his merits, and a wheel will be shown to be worth the amount of service to be obtained from it.

JNO. E. GREEN, Vice-President.

[The tests described by our correspondent are those which are made by nearly all the prominent wheel-makers, or at least by all who conduct their business as carefully as they should.—EDITOR RAILROAD GAZETTE.]

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## Editorial Announcements.

**Passes.**—*All persons connected with this paper are forbidden to ask for passes under any circumstances, and we will be thankful to have any act of the kind reported to this office.*

**Addresses.**—*Business letters should be addressed and drafts made payable to* THE RAILROAD GAZETTE. *Communications for the attention of the Editors should be addressed* EDITOR RAILROAD GAZETTE.

**Advertisements.**—*We wish it distinctly understood that we will entertain no proposition to publish anything in this journal for pay,* EXCEPT IN THE ADVERTISING COLUMNS. *We give in our editorial columns* OUR OWN *opinions, and those only, and in our news columns present only such matter as we consider interesting and important to our readers. Those who wish to recommend their inventions, machinery, supplies, financial schemes, etc., to our readers can do so fully in our advertising columns, but it is useless to ask us to recommend them editorially, either for money or in consideration of advertising patronage.*

**Contributions.**—*Subscribers and others will materially assist us in making our news accurate and complete if they will send us early information of events which take place under their observation, such as changes in railroad officers, organizations and changes of companies, the letting, progress and completion of contracts for new works or important improvements of old ones, experiments in the construction of roads and machinery and in their management, particulars as to the business of railroads, and suggestions as to its improvement. Discussions of subjects pertaining to* ALL DEPARTMENTS *of railroad business by men practically acquainted with them are especially desired. Officers will oblige us by forwarding early copies of notices of meetings, elections, appointments, and especially annual reports, some notice of all of which will be published.*

## THE CAR-LOANING BUSINESS.

The first corporation in this country to make a business of loaning cars and other rolling stock is the United States Rolling Stock Company, which, organized chiefly to supply a single line with stock, is now dependent upon the general demand of the country for such accommodations. It is a little remarkable that this business should have been begun so late in this country, as it has long been well established in England and on the Continent of Europe, where railroad companies are less likely than here to lack the capital to provide themselves fully with rolling stock. The American company has had great difficulties to encounter, owing to its peculiar relations with the Atlantic & Great Western, on account of which a large proportion of its cars were made of the exceptional 6-ft. gauge, and so its early experience was not of a kind to demonstrate clearly whether there was need in this country of such a business as it proposed to carry on. Latterly, however, its experience has been more nearly normal, and tends to show what kinds of service the country is likely to require of it permanently.

The business of this company is of such a nature as to serve pretty well as a gauge of the activity of traffic in the country. When companies have rolling stock enough of their own, they of course do not wish to hire any, and if they have a surplus they frequently are willing to let some of their cars to their neighbors.

Now not only are all the Rolling Stock Company's cars, both freight and passenger, let, but it has calls far in excess of its ability to supply. The passenger business of course has been greatly stimulated by the Centennial, and roads which are abundantly equipped for any ordinary traffic are now glad to hire coaches for short periods at very remunerative prices—often gladly paying twice the ordinary rental. Among the customers for coaches are the Baltimore & Ohio and the Pittsburgh, Cincinnati & St. Louis—lines heavily equipped with passenger stock. This business is not likely to be active long, however, and it is reasonable to suppose that passenger cars will be a drug in the market when winter comes.

With freight cars it is different. There is no great abnormal freight movement. Freight business is usually very active at this season, but there does not appear to be any unusual concentration of the year's business at this time. Traffic is heavy, and, so far as appears, likely to be heavy, and some of the strongest companies are calling on the Rolling Stock Company to make up their deficiency in car capacity.

The prospect for business is such, however, that the company has felt compelled to provide not only for doing what it now has, but for extending it. Last week it purchased at foreclosure sale the car shops in Chicago constructed a few years ago by the experienced contracting and bridge-building firm of F. E. Canda & Co. The grounds, embracing thirteen acres, are on the south branch of the Chicago River, in a district devoted chiefly to manufacturing and the lumber business, for which it is peculiarly well fitted by reason of the readiness with which heavy materials may be received and shipped, lake vessels and canal boats reaching the docks on the river, and railroad tracks connecting it with the whole system of Chicago railroads. The grounds purchased by the Rolling Stock Company have docks on the South Branch; the buildings are extensive and well provided with tools for car-building, not used long enough to have depreciated much. The cost to the Rolling Stock Company was $107,500, said to be considerably less than half of the original cost only a few years ago. The company pays $47,500 cash, buying the property subject to an outstanding mortgage for $60,000. It thus acquires for a very small sum works where it can prosecute the repairs of its present stock and the construction necessary for its renewal and increase, and, what is a matter of importance for this company, ample storage grounds in what is probably the very best distributing centre for its peculiar business. It is already using the shops for the work of changing its 6 ft. gauge cars to the standard gauge; and, it is encouraging to learn, will probably soon find it necessary to construct a number of new freight cars to supply the demand. We understand that the expense of storage heretofore nearly equals the interest on the purchase money of the works.

This company has had its business to develop in this country, and as the original contract with the Atlantic & Great Western for a long time gave employment to most of its stock, it is comparatively recently that the ordinary demand of the country for the material which this company has to rent was developed. As the business of the country has been in a very depressed and unnatural (at least unusual) condition for the past three years, it is not probable that the full demand has been developed yet. But so far the chief requirements have been for freight cars. Locomotives have rarely been wanted, and even now, when traffic of all kinds is very heavy, much of this company's stock of engines is in store. Passenger cars usually have not been much sought for, and this was to be expected, for passenger traffic in this country increases very slowly, and usually the difference between a light and a heavy traffic season is shown not so much by longer trains as by fuller ones. So far as engines are concerned, it really seems that quite generally of late years railroad managers have learned to make their engines do a larger amount of work. Very generally reports show that the average freight-train load has increased materially—not often so much as on the New York Central & Hudson River, where the average tonnage increased about two-thirds in two years, but still by a considerable percentage. Moreover, on some lines, the engines have been made to run more miles in a year as well as to haul more tons in a train; and both these changes have tended to reduce the stock of engines needed to do a given amount of work. Thus, it is not impossible that the Rolling Stock Company will find customers for its engines when the supply has been reduced more nearly in proportion to the modern demand for motive power.

A business, and a not unimportant one, which has been developed by the Rolling Stock Company is one which doubtless was never dreamed of when the corporation was organized, namely, the supply of cars for traveling circuses and menageries. These establishments, often having an enormous stock of men, animals and materials, formerly moved exclusively (as they still do largely) in wagons by the country roads, the vast structure of a day being demolished and loaded up immediately after the evening performance and dragged by night to the place of the next exhibition, at great expense for horses and wagons, of course, and with infinite weariness. Now many of these establishments travel exclusively by rail; but they need a large number of cars specially fitted for their purposes. Some of them rent coaches which they fit with berths, so as to provide quarters of their own for a part of their force, and so reduce their great hotel bills. The time on the road between places of exhibition is reduced to a fraction of that formerly required, and various other advantages are attained, all of which make it probable that the "show business" of the future will be a railroad business; and as there are many scores of such shows in this country, and each show requires several cars, it will be seen that the providing of these cars makes quite a business of itself an entirely new business, and an addition to what could be counted upon originally. (A business, too, we may say, by the way, which gives work of a fearful and wonderful kind to the car-painters). This adds to the business of the railroad companies as well as to that of the car-loaning company, of course, though it is of less importance to the former than to the latter.

The establishment of a company to loan cars seems likely to develop other new uses for cars or extensions of the old uses. Some manufacturing companies, for instance, will hire cars for a season which would never purchase them; while applications are sometimes made for cars to be fitted as travelling stores—peddlers' wagons on a large scale—intended to run from station to station, wherever sales can be made, and to be established on side tracks for as long a time as custom is good, and then move on. It is quite possible that there may be a considerable development of business of this kind in districts where the population is too sparse to support good permanent stores at stations. There was formerly (perhaps there is still) a similar business conducted on boats on the Mississippi and its tributaries.

The demand on this company also indicates that there is likely to be a considerable revival in the car-building industry. In a great many cases during the past three years railroad companies have not fully maintained their car stock. Beginning with a stock exceeding their requirements when the season of extraordinary activity came to an end in 1873, and that stock generally in excellent condition, with a lighter business they did not need to maintain their full stock, and with decreased earnings they have been loth to when at last they needed it. Now we find the supply, for the time at least, short; the companies have borrowed till they can borrow no more, and next they must become buyers and builders if any thing like the present activity in business continues. The experience of the Rolling Stock Company also indicates that the revival in the demand for locomotives will come later. With every available car actively employed, the motive power seems adequate to the work: at least there are no applicants for engines which the company has in store. This of itself indicates what we have said above, that the railroad companies have learned how to get more work than formerly out of their engines.

A brisk winter's business (and if there is a European war we are pretty sure to have a very large business this winter) will be likely to develop weaknesses in equipment not hitherto observable. The companies which have "starved" their stock may find their traffic interrupted just at the time when it is most valuable, by the giving out of cars and engines which have only been kept up so that they would "do" while the companies have had unsatisfactory profits. Certainly the heavy traffic of the past season cannot have been done without a great consumption of rolling stock, and this consumption must before long be made good.

## Steel Rails in Germany.

Government Counsellor Funk, of Cologne, contributes to the *Journal* of the German Railroad Union the experience of the Cologne & Minden Railroad with steel and other rails. A translation of a long paper on the early experience of this road with Bessemer rails was recently (Aug. 11) published in the *Railroad Gazette*. Herr Funk's paper seems to give a continuation of the experience with the same rails. An experiment was made with rails of different materials under similar circumstances by laying in the fall of 1864 on both sides of the Oberhausen station, which is the most used part of the main line of the Cologne & Minden road, 150 fine-grained rails, 150 cemented rails, 12 of Funke & Elber's puddled steel rails, 12 of Hoesch & Sons' puddled steel rails, 149 of Hoesch & Sons' Bessemer rails, 147 of Krupp's Bessemer rails, and 150 Bessemer rails from the Hoerde Works. On the 1st of October, 1875, after eleven years' service, 115, or 76.7 per cent., of the fine-grained rails had been renewed, 95, or 63.3 per cent., of the cemented iron rails, 4, or one-third, both of the Funke & Elbers' and the Hoesch & Sons' puddled steel rails, and of the Bessemer rails, 7, or 4.7 per cent., of the Hoesch & Sons, 6, or 4.1 of the Krupp, and 2, or 1.3, of the Hoerde rails; Of the Bessemer rails, one broke through the bolt holes, one scaled off on the head, and the other three were beaten down and flattened out at the joints, without being entirely spoiled. Pieces were cut from the ends and then they were used again in sidings. The flattening at the joints is charged to the form of the rails, which had a pear-shaped section and could not be fastened firmly at the joints. Taking the mean of the Bessemer rails, the necessary renewals after 10 years' severe service was 3.4 per cent., against 33.3 per cent. of the puddled steel, 63.3 of the cemented and 76.7 per cent. of the fine-grained rails. The average tonnage of cars and their loads (excluding engines and tenders) over these rails was about 18,000 tons per day.

The result of this trial was the adoption of Bessemer steel for new construction and renewals on this road, which at the close of 1875 had more than a thousand miles of steel tracks. Altogether, the company has had in the eight years from 1868 to 1875 504,634 different Bessemer rails, which at the close of this period had been in the track on the average 2½ years. In that time 1,625 had been replaced, or 0.322 per cent. of the whole number. At the end of 1875 the iron rails then in the tracks of this road had been in service on the average 6.98 years, and within that year 6¾ per cent. of them had been replaced, while in the same year only 0.2 per cent. of the Bessemer rails (in the track an average of 3.8 years) had been renewed.

On this road experience has not shown that steel rails break easier than iron ones: 0.238 per cent. of the whole number had

broken down to the end of 1875. But a much larger proportion than of iron ones break very soon after they are put into the track, often under the first train that runs over them.

This railroad since 1867 has bought 17,600 tons of iron rails and 153,000 of Bessemer rails; but since 1872 it has bought nothing but Bessemer rails. The largest orders were given when steel rails were a third or a quarter dearer than iron; still the economy by their use was very great. Now when there is (in Germany) comparatively little difference in the prices of iron and steel rails, there is no room left to doubt which material to choose.

### The Grain Movement for Twenty-four Weeks.

The shipments of grain of all kinds from the eight principal Northwestern markets for each week since April 22 have been, in bushels, by lake and by rail:

| Week ending— | By lake. | By rail. | Total. | Per ct. by rail. |
|---|---|---|---|---|
| April 29 | 1,634,541 | 2,072,946 | 3,707,487 | 56 |
| May 8 | 2,445,191 | 2,292,633 | 4,737,824 | 48½ |
| " 13 | 1,538,526 | 2,302,940 | 3,841,466 | 60 |
| " 20 | 1,602,170 | 2,016,304 | 3,618,474 | 55¾ |
| " 27 | 1,747,408 | 1,820,456 | 3,567,864 | 51 |
| June 3 | 2,412,162 | 1,797,922 | 4,210,084 | 42¾ |
| " 10 | 2,894,915 | 2,147,670 | 5,042,585 | 42½ |
| " 17 | 2,921,405 | 2,391,811 | 5,313,216 | 45 |
| " 24 | 2,728,706 | 2,198,054 | 4,926,760 | 44½ |
| July 1 | 1,821,155 | 1,784,548 | 3,605,703 | 49¾ |
| " 8 | 1,765,010 | 1,205,184 | 2,970,194 | 40½ |
| " 15 | 1,648,508 | 1,228,678 | 2,877,186 | 42¾ |
| " 22 | 2,269,336 | 1,032,825 | 3,302,161 | 31½ |
| " 29 | 1,466,502 | 1,038,208 | 2,504,710 | 41½ |
| Aug. 5 | 2,055,243 | 1,283,268 | 3,338,511 | 38½ |
| " 12 | 1,744,059 | 1,300,720 | 3,044,779 | 42¾ |
| " 19 | 2,150,292 | 1,614,256 | 3,764,548 | 42¾ |
| " 26 | 2,352,152 | 1,520,811 | 3,872,963 | 39⅓ |
| Sept. 2 | 1,698,491 | 1,573,058 | 3,271,549 | 48⅓ |
| " 9 | 2,374,473 | 1,818,411 | 4,192,884 | 43⅓ |
| " 16 | 2,963,634 | 1,688,318 | 4,651,952 | 36⅓ |
| " 23 | 2,268,894 | 1,820,361 | 4,089,255 | 44½ |
| " 30 | 2,427,357 | 1,797,847 | 4,225,204 | 42½ |
| Oct. 7 | 3,009,394 | 1,650,858 | 4,660,252 | 35⅓ |
| Total for 24 weeks | 51,939,524 | 41,398,087 | 93,337,611 | 44⅓ |

The movement from the last week was the largest of the fall, but the entire increase, and more, was taken by the lake vessels, while the railroads have had so small a proportion of the traffic only once this season, and have not had so small a quantity since August. The indications are that the railroads are not working for grain traffic; for this decreased rail movement is in the face of increased water rates, which would naturally turn the grain to the rail route. The lake rates are now more than double the summer rate. Indeed, the rates by lake and canal quoted Monday of this week, amounting to 12 cents per bushel for corn and 13 cents for wheat from Chicago to New York, besides the elevator charge (¾ cent, we believe,) at Buffalo, makes it hard to see how the railroads can keep their rates as low as they are—amounting to 11.2 cents per bushel for corn and 12 cents for wheat. They could not carry all the grain if it was offered to them, doubtless; and as we see they have not been getting nearly half of it to carry. It is not true, however, that grain will always choose the quick rail route when the rate is as low as by the water route. At this season of the year grain is hurried forward, not for any immediate export or consumption, but to be stored to meet the winter demand. It is not an object to hasten this grain to the seaport store-houses, but there is some gain by delaying it on the road; for storage costs something in the store-houses and nothing in the lake vessels and canal boats. Still, it is not probable that a difference of two cents a bushel in favor of the water route can be maintained.

For the same 24 weeks the receipts at the different Atlantic ports have been:

| | Corn. | Per cent. of total. | All grains. | Per cent. of total. |
|---|---|---|---|---|
| New York | 16,007,841 | 32.8 | 40,707,080 | 44.6 |
| Boston | 5,127,453 | 10.5 | 7,056,421 | 7.7 |
| Portland | 453,400 | 0.9 | 811,470 | 0.9 |
| Montreal | 2,996,788 | 6.2 | 9,883,522 | 10.8 |
| Philadelphia | 11,748,150 | 24.0 | 17,068,200 | 18.7 |
| Baltimore | 10,793,900 | 22.1 | 13,375,085 | 14.7 |
| New Orleans | 1,737,968 | 3.5 | 2,382,144 | 2.6 |
| Total | 48,865,500 | 100.0 | 91,283,922 | 100.0 |

New York has advanced materially in rank during the last week, both in receipts of corn and in those of all grains, while Baltimore and Philadelphia fall back a little, though but a little; for part of New York's gain has been taken from Boston and New Orleans.

During the last week reported, the percentage of the total receipts of corn at each port were: New York, 47⅔; Philadelphia, 20½; Baltimore, 14; Montreal, 9¾; Boston, 5¼. In grain of all kinds these percentages were: New York, 56⅓; Philadelphia, 16¼; Baltimore, 10¼; Montreal, 8¾; Boston, 6 per cent.

The movement in the Northwest is now heavier than before this year and perhaps, so far as receipts are concerned, heavier than ever before. Corn continues to be the chief grain moved, but wheat is moving much more freely than heretofore. Hitherto the movement of the last wheat crop has been the lightest for four years, and little more than half that of 1873, which is the largest hitherto recorded.

### Record of New Railroad Construction.

This number of the *Railroad Gazette* has information of the laying of track on new railroads as follows:

*Cincinnati & Eastern.*—The first track is laid from Plainsville, O., eastward to Batavia, 15 miles. It is of 3-ft. gauge.

*Burlington & Northwestern.*—The first track is laid from Mediapolis, Ia., westward 5 miles. It is of 3-ft. gauge.

*Tennessee Coal & Railroad Co.*—This company's road is extended 1½ miles to new mines. It is of 5-ft. gauge.

This is a total of 21⅓ miles of new railroad, making 1,740 miles completed in the United States in 1876, against 903 miles reported for the corresponding period in 1875, 1,180 in 1874, 2,897 in 1873, and 5,147 in 1872.

THE FALL RIVER STEAMBOAT MANAGERS take exception to a letter of complaint concerning this line, or rather of the conduct of some of its employes, published in the last number of the *Railroad Gazette*. The letter, which was facetious as well as condemnatory, was signed by the name of the writer, known to us as a responsible person; but many of the "vicissitudes" therein complained of were certainly not the fault of the steamboat company or of any of its employes, though the casual reader might easily lump together the traveller's inconveniences from the excessive heat and the great crowd, and his being too late to get a state-room, with the alleged rudeness of the steamboat men, and charge it all against the company. Further, the officers of the line protest that the charges of rudeness, neglect, etc., against the employes could not have been well grounded; that at most they must have been grossly exaggerated. Their traffic has been this year enormous, and doubtless passengers would have been more comfortable had the boats had fewer to carry. But that rudeness or extortion or heedless neglect of their passengers' comfort is permitted or tolerated on their line, they indignantly deny; and they think that the steady patronage of the public in the face of great competition is evidence that the conduct of their men can hardly be "ruffianly." Especially they complain that while by far the greater part of the complaints of our correspondent were occasioned by circumstances which the steamboat company could not possibly be responsible for, yet the tone of the letter tends to charge everything upon it. We are told by those who have often traveled by the line, that they have never observed such conduct on the part of its employes as that of which Mr. Bliss complains, and certainly what we have seen of those who command these employes makes us loth to believe that they would knowingly tolerate anything remotely like "sea-ruffians" on their boats.

THE BREAKAGE OF CAR WHEELS, according to some recent reports to which our attention has been called, increased with the average mileage of the wheels. Perhaps in the discussion of this subject during the last year or two not enough attention has been given to the prevention of breakage and too much to securing a large average mileage. The latter is undoubtedly desirable, but of the two it is much more important that the breakages should be as few as possible and thus danger to life and property be avoided, rather than secure a trifle more service for the money expended.

The indications are that, since some railroad companies are holding wheel-makers to a more rigid accountability for the service performed by the wheels furnished, the latter, in order to meet the guarantees of mileage required of them, are making their wheels harder and more brittle, which accounts for the breakage. It may, of course, be said that if a large average mileage is required, a corresponding percentage of breakage may be expected, which is true if inferior qualities of iron are used. There is not much difficulty in making even very inferior qualities of iron hard, but at the same time it becomes correspondingly brittle. It is only the best qualities of material which are capable of giving a hard chill and at the same time making the body of the wheel tough enough to resist breakage.

In making contracts for wheels, therefore, it will doubtless be well to specify the average mileage that is required, but also to affix some sort of forfeiture for breakage. Railroad officers will also do well to observe their records of wheel service to see what is the proportion of breakage to the mileage.

THE AMERICAN INSTITUTE OF MINING ENGINEERS will hold its next meeting in the hall of the Franklin Institute, Philadelphia, beginning Oct. 24. It has been decided to have no excursions, that members may give all their spare time to the Exhibition. Early notice of papers to be read should be given to the Secretary, Prof. Thomas M. Drown, Easton, Pa.

HIGHER RATES are prophesied, at least on east-bound traffic; and though no definite negotiations on the subject can be cited, the belief seems to be general that rates will advance. The fact is that it is likely soon to be necessary to advance rates to save the roads from a blockade. The pressure of traffic which has already trebled the summer lake rate is almost certain to affect the rail rates soon.

## Contributions.

### Rolling Stock on English and American Railroads.

TO THE EDITOR OF THE RAILROAD GAZETTE:

A copy of your contemporary, the *Railway Age*, came into my hands the other day, from which I send you a "clipping," which I hope is not a specimen of its statistics.*

I enclose an accurate statement of the rolling stock belonging to the thirteen English and Scotch railways referred to, and have compared them with Poor's figures in his 1875-1876 work as I make them to be, and I have appended the mileage in the totals, which are as follows:

| Description. | Thirteen English roads. | Thirteen American roads. |
|---|---|---|
| Locomotives | 9,268 | 5,002 |
| Passenger cars | 27,858 | 3,899 |
| Freight and service cars | 282,755 | 124,837 |
| Miles owned and leased | 10,741 | 12,329 |

A better comparison may be instituted by working out the percentages which appear follows:

| Rolling stock per 100 miles of road. | Great Britain. | United States. |
|---|---|---|
| Locomotives | 86 | 41 |
| Passenger cars | 259 | 31 |
| Freight and service cars | 2,632 | 101 |

The principal reason why the freight cars are so much more numerous on the English than the American roads is, that in round figures each car represents little more than half the capacity, and with regard to the passenger stock the number of passengers per car is not much more than one-third, and this, together with the heavier English train service, especially in the passenger department (which is borne out by the greater number of locomotives) will, I think, fully account for the difference in passenger car stock.

You will notice that whereas the thirteen American roads have 13 per cent. more miles operated than the English, the latter have 85 per cent. more locomotives, 616 per cent. more passenger cars, and 126 per cent. more freight cars.

VERITAS.

OCTOBER 2, 1876.

* This article gives the number of locomotives of the thirteen English roads as 10,560, and the number of cars as 32,000.—EDITOR.

STATEMENT OF ROLLING STOCK ON 13 LEADING BRITISH RAILWAYS, HALF YEAR ENDING DEC. 31, 1875.

| Name of Railway. | Locomotives. | Passenger Carriages. | Goods Wagons. | Miles open. |
|---|---|---|---|---|
| London & North Western | 2,019 | 4,813 | 41,360 | 1,588½ |
| Midland | 1,196 | 3,126 | 31,039 | 1,260½ |
| Great Eastern | 475 | 1,847 | 10,478 | 764½ |
| " Northern | 533 | 1,713 | 15,319 | 701¾ |
| South Eastern | 255 | 1,044 | 3,851 | 331¼ |
| Great Western | 1,223 | 3,437 | 27,634 | 1,586 |
| North Eastern | 1,331 | 2,499 | 76,158 | 1,400½ |
| Manch'ter, Sheffield & Lincolnshire | 374 | 697 | 10,376 | 421¾ |
| London & South Western | 363 | 2,116 | 5,871 | 702 |
| " Brighton & South Coast | 270 | 1,918 | 4,290 | 359½ |
| " Chatham & Dover | 142 | 786 | 1,179 | 134½ |
| Caledonia | 634 | 1,496 | 32,693 | 711 |
| North British | 453 | 1,566 | 22,507 | 782¼ |
| Totals | 9,268 | 27,848 | 282,755 | 10,741½ |

The actual miles are only those owned and leased by above lines of railway, and do not include lines over which part of the rolling stock works by "running powers" granted by act of Parliament.

### Erecting Locomotive Guide Bars.

TO THE EDITOR OF THE RAILROAD GAZETTE:

It is a terrible satire upon the literature devoted to the instruction of mechanics upon workshop manipulation when a writer giving instructions for the proper method of doing a piece of work is told by a workman who disagrees with the instructions given, "If he is a book-learned mechanic, I forgive him." Whatever a man's hands can do, his brains ought to be able to tell another how to do; for the hands only obey the dictation of the brain. But the fact is, that to be a good workman is one thing; to perceive the principles underlying one's daily practice is another thing; to have the gift to explain and impart what one does know, is yet another thing; and to have had an experience sufficiently large and to have made a study of gathering from that experience its lessons for the purpose of imparting it to others in a way that they can clearly understand and appreciate, is still another thing; and to combine all these elements in one man is not so easy as to make books upon workmanship such as commend themselves as authoritative to workingmen. Hence book-learned mechanics, I am sorry to say, really require, in a very large majority of cases, to be forgiven (when the term mechanic is applied to the actual workmanship). There is, however, in this connection a serious evil in that the prejudice against book information tends to destroy the usefulness of even the valuable information books do, and yet can be made to further, contain. These remarks, Mr. Editor, are called forth not by "Young Machinist's" solitary remarks, but from contact with hundreds of workmen.

After having worked over twenty years in the workshop and having made many times over every part of a locomotive, from one end to the other, both in lathe work, vise work and at erecting, and all the working parts by piece work over and over again—after this experience, I went to a workshop in the interest of the purchaser to overlook the construction of an engine. I had just then begun to write instructions for workmen and upon workmanship. Well, the men heard of it, and that was enough. Not even the apprentices could be induced to profit by the advice I offered to them, until, taking a hexagon brass of 3⅛ across and 7 inches long I took hold of a hammer and chisel and chipped and filed it in far less time than those took which were planed before being fitted. After that the boys and the men would consult me upon every offering occasion, often indeed upon almost ridiculously trivial matters. "Young Machinist's" directions for setting guide bars remind me of the carpenter who, walking up Broadway with extended arms, said: "Don't knock against me: I've got the size of a door."

Before convincing "Young Machinist" that his instructions as they stand are altogether impracticable under any reasonable circumstances, and that even with amendment they are too slow and imperfect for any decent regard for what is known as good workmanship, I will remark that as far as what is termed proper workmanship is concerned, it is only relative. For instance, Mr. Brown, of Fitchburg, Mass., requires his workmen to make his *slide spindles* and *stuffing boxes* such a fit that they run for months without any packing whatever on them, and yet are steam-tight; and if one of them leaked he would call that bad workmanship, which, relative to his standard, it actually is. Again, I filed up by piece work about 1,000 locomotive guide bars. Each was tested by a surface plate, and the standard was so fine that, when the inspector on one occasion rested them upon their ends, upon pieces of wood, and had the surface plate applied, the bars were sent back to me as hollow in their lengths, and hence improperly fitted. On putting a number of them in the vise again, I found them, one after the other, to be true; and a moment's consideration showed me that the test was so fine that the deflection of the bar from its own weight was detected. Now these bars were of steel, and about 1⅛ in. thick at the middle and ¾ thick at the ends, such was that superintendent's standard. Now the only objection to such a standard would be its cost. Well my price was as follows: 8 guide bars and four guide blocks, the surface skin removed on a grindstone, to be got up true as above with a superfine smooth file, price $4.20; for engines having 4 bars, price $1.92. The grinding, however, was done by a plan of my own, and was well done. I fitted up over 1,000 pedestal boxes (chipping and filing) hexagon bottoms, chipping marks filed out, brasses bedded to mark so as not to leave one square inch unmarked, using a fine coat of marking, brasses 6 inches, bore 9 inches long; price for fitting box

complete, $1.74. This, however, being English practice, let me quote some American: Locomotive cylinders taken with the boring and planing done; work to be done, all the drilling, tapping, making ground cover joints, cutting out ports, scraping up valve seats and valve faces, fitting up cylinders complete in fact, delivering them bolted together and ready for the engine, paying assistant out of price, price $30 an engine; time 24 hours. It is unnecessary, however, to repeat, hence I return to the original question: How to set locomotive guide bars.

What is there in "Young Machinists'" given plan to form any guide as to whether the edge face of the guide bar stands true? That is, suppose he drew a line along the centre of the length of the bar, what assurance has he in his plan that that centre line won't stand ⅛ inch or any other quantity out of plumb with the line stretched through the cylinder bore, in which case the flange of the cross-head would bind so hard that it would take an engine to move it unless the width of the cross-head flanges was such as to be ⅛ inch clear of the edges of the bars, and in that case what is the use of those flanges?

Now for a more serious matter: suppose the crank-pin to stand horizontally level. If then across the face of the guide-bar don't stand level, the cross-head journal won't stand level, and the connecting-rod must be twisted or it will twist itself in the keying up, unless the connecting-rod brasses were bored atwist to suit the twist existing between the crank-pin and cross-head journal. This, however, is too ridiculous to entertain. It is only reasonable to suppose that "Young Machinist," forgetting some part of the process he intended to advocate, showed himself as incapable of giving instructions as he is unwilling to receive them. But his error does not end here, for the placing the bars parallel with the centre line of the cylinder is only a few minutes' work; the job is to bolt them up so that they will remain so, for the faces of the end of the bars bedding near the bolt holes are, compared to the length, a half the length of the bar, very short, and unless the slips or liners are bedded very true, the bars will spring in bolting them up, making the bar faces hollow or rounding in their lengths; and this is why the red marking is necessary, absolutely necessary to a good fit. Does "Young Machinist" mean to say that the piston rings fit so tightly between the piston-head and follower as to hold the piston-head off the bottom of the cylinder? If they do they are a botch job. As to the expansion boring out the gland, the quoted Mr. Brown's slide spindles answers that. And I may add that the gland and packing ring being a good working fit, and the bars being set as I tell him, he may take hold of the cross-head when the job is done and push the cross-head and piston from end to end of the stroke, and he may examine the faces of the bars top and bottom, and see by the bearing marks that the cross-head fits, flanges and all, from end to end, the fit at the end being very light, because there is not so much wear there; and in filing up the bars the faces at the ends should be eased off a little at end towards the clearance groove. Thus the bars will be truly guides, an easy working fit, and the job will take him about five hours if he is a good workman.

THE WRITER OF THE DIRECTIONS.

## The Philadelphia Awards.

Continuing the list of awards most interesting to our readers we give the following:

INSTRUMENTS OF PRECISION, RESEARCH, ETC.

JUDGES.—*American*—Prof. Joseph Henry, Washington; Prof. F. A. P. Barnard, New York; Prof. J. E. Hilgard, President, Washington; Prof. J. C. Watson, Secretary, Ann Arbor, Mich.; Gen. Henry K. Oliver, Salem, Mass.; George F. Bristow, New York. *Foreign*—Sir William Thomson, LL. D., D. C. L., Great Britain; Jul. Schiedmayer, Germany; E. Levasseur, France; P. F. Kupka, Austria; Theodore Grebi, substitute for Edward Favre Perret, Switzerland.

James Prentice, New York, Surveying and Leveling Instruments.

T. Alteneder, Philadelphia, Drawing Instruments.

George M. Eddy & Co., Brooklyn, N. Y., Measuring Tapes.

James W. Queen & Co, Philadelphia, Pa, Mathematical and Drawing Instruments, Microscopes.

William B. Watkins, New York City, Instruments of the Automatic Signal Company.

Washburn & Moen Manufacturing Company, Galvanized Telegraph Wire.

Welsh & Anders, Boston, Mass., Magnetic Printing Telegraph Instruments.

Western Electric Manufacturing Company, Chicago, Ill., Brooks' Insulators.

Western Electric Manufacturing Company, Chicago, Ill., Brooks' Printing Telegraph.

Western Electric Manufacturing Company, Chicago, Ill., Railway Train Signals.

Heam & Harrison, Canada, Surveying Instruments.

S. W. Robinson, Champaign, Ill., Odontograph.

Prof. S. W. Robinson, Champaign, Ill., Dividing Machine for Unequal Parts.

William Kuebler, Philadelphia, Pa., Surveying Instruments.

Heller & Brightley, Philadelphia, Pa., Surveying Instruments.

Darling, Brown & Sharpe, Providence, R. I., Straight Edges, Scales, Squares, Wire Gauges, etc.

C. Fauth & Co., Washington, D. C., Astronomical and Surveying Instruments.

Eagle Square Manufacturing Company, South Shaftesbury, Vt., Steel Squares and Rules.

Stanley Rule and Level Company, New Britain, Conn., Rules, Levels, etc.

Prof. Robert H. Thurston, Hoboken, N. J., Machine for Testing Strength of Materials.

Thomas Shaw, Philadelphia, Pa., Pressure Gauge.

John Bliss & Co., New York City, Marine Chronometers and Portable Transits.

ARCHITECTURE AND ENGINEERING.

JUDGES.—*American*—James B. Eads, C. E., New Orleans; Gen. Wm. B. Franklin, President, Hartford, Conn.; Richard M. Hunt, New York; Col. George E. Waring, Jr., Newport, R. I. *Foreign*.—Sir John Hawkshaw, C. E., Great Britain; Edward Lavoinne, Secretary, France; J. M. Da Silva Continho, Brazil; J. G. W. Fynje, Netherlands; Lourenco Maineiro, M. E., Portugal.

Richard P. Morgan, Jr., Bloomington, Elevated Steam Railway.

Detroit Bridge & Iron Works, Detroit, Bridge over Missouri River at St. Joseph.

Fire-proof Building Company, New York, Hollow Blocks and Hollow Bricks, made of Hydraulic Lime of Teil.

Garry Iron Roofing Company, Cleveland, Ohio, Iron Roofing.

United States Hoisting and Conveying Machine Company, New York, Hoisting and Conveying Machines or Apparatus.

The Gunpowder Pile Driver Company, Philadelphia, Gunpowder Pile Driving Machine.

Keystone Bridge Company, Philadelphia, Improvements in Pivot or Swing Bridge, Riveted Columns.

Pennsylvania Geological Survey Commission, Geological Map in Relief, Pennsylvania.

Pennsylvania Geological Survey Commission, Geological Charts, Relievos and Profiles, Pennsylvania.

Engineers' Department United States Army, Washington, D. C., Maps and Charts of the Survey of the Lakes.

Engineers' Department United States Army, Washington, D. C., Reports and Maps of Surveys of Various Parts of the United States.

Interior Department, Washington, D. C., Statistical Maps.

Signal Corps United States Army, Washington, D. C., Meteorological Maps.

F. C. Lowthorp, Lowthorp & Henderson, Trenton, N. J., Plans for Iron Bridges and Turn Tables.

Gen. Wm. Sooy Smith, Maywood, Cook County, Ill., Drawings of Pneumatic Caisson.

United States Coast Survey, Washington, D. C., Maps and Charts.

United States Geological Survey of Territories, United States Geological Maps.

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Also the following from various groups:

*For Windmills.*—Eclipse Windmill Co., Beloit, Wis.; Gammon & Deering, Chicago; E. Stover & Bro., Freeport, Ill.; United States Wind Engine Co., Batavia, Ill.

*Shovels and Spades.*—Oliver Ames & Sons, Easton, Mass.; Maxwell, Rowlan & Co., Philadelphia; B. Rowland & Co., Philadelphia; George Griffith, Philadelphia; T. Rowland & Son, Philadelphia.

*Lubricating and Other Oils.*—Crene, Moore & Lerick, Philadelphia; Galena Oil Co., Franklin, Pa.; Gest & Attinson, Cincinnati; Aladdin Lubricating Oil Works, Philadelphia; E. F. Houghton & Co., Philadelphia.

A. J. Nellis & Co., Pittsburgh, Pa., Patent Process of Chilling Steel.

C. M. Bowen, Vineland, N. J., Stump and Rock Extractor.

Huber Manufacturing Company, Marion, O., Road Scrapers.

Randolph Bros., New York, Ditching and Dredging Machines.

Rhodes & Waters, Elyria, O., Eureka Post-hole Digger.

P. J. Stryker, New Brunswick, N. J., Self-loading Excavator.

Chicago Scraper and Ditcher Company, Chicago, Ill., Road Scraper.

Begg, Paterson, N. J.—Model of Locomotive, Train of Passenger Cars and Track.

Bissell & Co., Pittsburgh—Isaac Dripp's Patent Railroad Car Heaters.

William Page & Co., Boston—Railway and Steamship Lamps.

Cleveland Non-Explosive Lamp Co., Cleveland, Ohio—Metallic Safety Lamps.

Laflin & Rand Powder Co., New York—Magnetic Electric Blasting Machine, also Friction Electric Blasting Machine.

Thomas Shaw, Philadelphia—Pressure Gauge.

Osterfeld & Eickemeyer, Yonkers, N. Y., Dynamometer.

*Scales, Platform and Other.*—E. & T. Fairbanks & Co., St. Johnsbury, Vt.; Brandon Manufacturing Co., Brandon, Vt.; Richie Brothers, Philadelphia; Buffalo Scale Co., Buffalo.

# General Railroad News.

## ELECTIONS AND APPOINTMENTS.

*Allegheny Narrow Gauge.*—This company was organized at a meeting held in Pittsburgh, Oct. 6, by the election of the following directors: Thomas M. Bayne, J. Birmingham, A. C. Patterson, Hugh Forrester, J. F. Stockdale, Wm. Roseburg, M. B. Cochrane, D. L. Patterson, G. W. Murphy. The board elected Thomas M. Bayne, President; George C. Murphy, Secretary; Wm. Roseburg, Treasurer.

*Railway Passenger and Freight Conductors' Mutual Aid and Benevolent Association.*—At the annual meeting in Chicago, Oct. 12, the following officers were chosen: President, James Sherman; Vice-Presidents, George Hewitt, A. M. Putnam; Secretary and Treasurer, Charles Huntington; directors, E. A. Ladd, H. L. Evans, David Hills, F. D. Underwood, Chicago; J. Ladd, Detroit; E. D. Latham, Bloomington, Ill.; N. S. Sears, Adrian, Mich.

*Western Union Telegraph.*—At the annual meeting in New York, Oct. 11, the following directors were chosen: William Orton, James H. Banker, Alonzo B. Cornell, Harrison Durkee, Marvin Green, Joseph Harker, E. D. Morgan, Aug. Schell, W. K. Thorn, C. Vanderbilt, Frank Work, Chester W. Chapin, John R. Duff, Wilson G. Hunt, David Jones, C. Livingston, James Milliken, J. O. Mills, Levi P. Morton, O. H. Palmer, Geo. M. Pullman, E. S. Sandford, John Stewart, Moses Taylor, Dan'l Torrance, W. H. Vanderbilt, W. R. Vermilye, E. B. Wesley, E. D. Worcester. The board elected the following officers: President, Wm. Orton; Vice-Presidents, Augustus Schell, Norvin Green, Harrison Durkee; Secretary, H. R. Brewer; Treasurer, R. H. Rochester; Executive Committee, Wm. Orton, James H. Banker, A. B. Cornell, Harrison Durkee, Norvin Green, Joseph Harker, E. D. Morgan, Augustus Schell, W. K. Thorn, Frank Work, C. Vanderbilt.

*Pacific Mail.*—At a meeting of the board in New York, Oct. 14, Charles G. Miller was chosen First Vice-President, in place of George Scott, resigned, and Amos Rogers Second Vice-President, in place of J. B. Houston, resigned, to take another position in connection with the company.

*Cayuga.*—At the annual meeting in New York, Oct. 10, the following directors were chosen: E. B. Morgan, Tallmadge Delafield, A. Craig Palmer, Frederick Collins, William Elliott, George C. Morris, James Stillman, Alexander P. Fisk, I. B. Cole, A. H. Goss, James H. Cox, I. T. Cooke, John D. Thomas, A. C. Palmer, W. C. Murray. The board elected the following officers: Tallmadge Delafield, President; Frederick Collins, Vice-President; James Stillman, Secretary and Treasurer; A. Craig Palmer, Assistant Treasurer.

*North Simcoe.*—At the annual meeting in Barrie, Ont., Oct. 3, the following directors were chosen: Jeffrey Beck, Wm. Kelley, J. S. McMurray, Alexander Manning, A. A. Thomson, H. H. Thompson. The board elected J. S. McMurray President; A. A. Thomson, Vice-President; T. R. Fuller, Secretary and Treasurer.

*Gulf, Colorado & Santa Fe.*—At the annual meeting in Galveston, Tex., Oct. 3, the following directors were chosen: J. M. Brown, Walter Gresham, J. H. Hurt, W. J. Jones, N. N. John, M. Kopperl, C. B. Lee, A. P. Lufkin, H. Rosenberg, George Sealy, James Sorley, J. E. Wallis, R. S. Willis.

*Memphis & Charleston.*—At the annual meeting in Memphis, Tenn., Oct. 4, Mr. R. T. Wilson was re-elected President with the old board of directors, as follows: P. C. Bethel, G. P. Beirne, T. H. Cossit, W. W. Garth, N. Hill, C. N. McGhee, J. C. Neely, John D. Rather. The board re-elected Charles N. McGhee Vice President and General Manager.

*Grand Trunk.*—London telegrams state that Captain Henry Whatley Tyler has been chosen President in place of Mr. Richard Potter, resigned. Captain Tyler was previously Vice-President of the company. For many years he has been Chief Railway Inspector for the British Board of Trade. The change was entirely unexpected, being made at the half-yearly meeting. The regular election is six months later.

*Ohio & Mississippi.*—At the annual meeting in Cincinnati, Oct. 12, the following directors (one-fourth of the board) were chosen: L. B. Parsons, Flora, Ill., Frank W. Tracey, Springfield, Ill.; W. H. Bloodgood, New York. Mr. Bloodgood succeeds J. D. Lehmer, of Cincinnati; the others are re-elected. The board re-elected Daniel Torrance President, and chose the following committees: Executive and Finance Committee, Daniel Torrance, John King, Jr., W. H. Bloodgood; Auditing Committee, L. B. Parsons, F. W. Tracey, Theodore G. Meier.

*Ogdensburg & Lake Champlain.*—The New York Supreme Court has appointed Mr. Wm. J. Averill, of Ogdensburg, N. Y., Receiver. He has appointed Mr. John C. Pratt, President of the company, General Manager of the road.

*Western Maryland.*—The Mayor of Baltimore has nominated and the City Council has confirmed the following city directors in this company: Alex. Reiman, Daniel J. Foley, Samuel H. Adams, Nicholas J. Penniman, Wm. Seemuller, Enoch J. Hipsley, Christian Devries and J. Alex. Preston.

*Iron Mountain, Chester & Eastern.*—Mr. Charles J. Kingsbury has been appointed Auditor.

*St. Louis, Lawrence & Western.*—St. Louis papers report that Mr. George H. Rea, of St. Louis, has been appointed Receiver, and has continued all the officers of the road in their respective positions.

## PERSONAL.

—Ex-Gov. Jacob D. Cox, Receiver of the Toledo, Wabash & Western, has been elected to Congress as a Republican from the Toledo District, in Ohio. Governor Cox is a man of very high standing, and his political record has been in every way an honorable one.

—The Democrats of the Twenty-seventh Pennsylvania District have nominated for Congress Mr. Wm. L. Scott, of Erie, a director of the Lake Shore & Michigan Southern and several other companies, and formerly a railroad contractor.

—Hon. Chester W. Chapin, President of the Boston & Albany, has been renominated for Congress by the Democrats of the Eleventh Massachusetts District.

—Mr. Richard Potter has, somewhat unexpectedly, resigned his position as President of the Grand Trunk Railway Company, of Canada, which he has held for some years past.

—The Jersey City *Journal* says: "It is reported that Mr. George W. Barker, Superintendent of the New York Division of the Pennsylvania Railroad, has been offered the position of Assistant General Superintendent of the New Jersey Central, and is thinking about it. We don't believe he will take it. The Pennsylvania Railroad cannot afford to lose the services of so efficient an officer as Mr. Barker. Few men could carry such a responsibility as he does, and perform such a work so successfully. He has the aid of a very able and faithful body of subordinates, whose ability he fully recognizes."

—Mr. Thomas Ewing, President of the Ohio Central (late the Atlantic & Lake Erie) Company, has been elected to Congress as a Democrat from an Ohio district.

## TRAFFIC AND EARNINGS.

### Coal Movement.

Coal tonnages for the week ending Oct. 7 are reported as follows:

| | 1876. | 1875. | Inc. or Dec. | P. c. |
|---|---|---|---|---|
| Anthracite | 508,972 | 525,380 | Dec.. 16,408 | 3.1 |
| Semi-bituminous, Broad Top | 3,000 | ..... | ..... | .... |
| " " Clearfield | 18,190 | 20,741 | Dec.. 2,551 | 12.3 |
| " " Cumberland | 51,273 | 54,153 | Dec.. 2,880 | 5.3 |
| Bituminous, Barclay | 7,788 | 7,632 | Inc.. 156 | 2.1 |
| " Allegheny Region | 3,467 | 56,027 | Dec.. 15,385 | 27.5 |
| " Pittsburgh Region | 37,175 | | | |

The present low prices of anthracite are reported as having an injurious effect on the semi-bituminous coals, the demand for which is falling off. The same cause is given to account for decreases in the Pittsburgh Region shipments.

The actual coal tonnage passing over the Pennsylvania & New York Railroad for the nine months ending Sept. 30 was as follows:

| | Tons. |
|---|---|
| Anthracite, from Lehigh Valley R. R. | 355,759 |
| " " Bloomsburg Div., D., L. & W. R. R. | 208,821 |
| " " Pleasant Valley Branch | 20,573 |
| " " State Line & Sullivan R. R. | 32,239 |
| Total anthracite | 617,392 |
| Bituminous, from Towanda | 287,541 |
| " " Northern Central R. R. | 159 |
| Total bituminous | 287,700 |
| Total, all kinds | 905,092 |

In anthracite there was an increase of 22,463 tons, or 3.8 per cent.

The coal tonnage of the Belvidere Division, Pennsylvania Railroad, for the week ending Oct. 7 was: 1876, 29,080; 1875, 27,007; increase, 2,073 tons, or 7.7 per cent. Actual shipments from Coal Port and South Amboy were: 1876, 19,829; 1875, 24,840; decrease, 5,011 tons, or 20.2 per cent.

### Grain Movement.

San Francisco wheat and flour shipments for September were 2,740,333 bushels of wheat, all to Great Britain, and 51,700 barrels of flour, of which 25,400 went to Great Britain, 20,000 to China and Japan, and the rest to the Pacific islands and Central America. For the first three months of the California crop year, ending Sept. 30, shipments were as follows:

| | 1876. | 1875. | Increase. | P. c |
|---|---|---|---|---|
| Flour, barrels | 109,400 | 94,900 | 14,500 | 15.3 |
| Wheat, bushels | 5,404,833 | 3,348,500 | 2,056,333 | 61.4 |
| Total, bushels | 5,951,833 | 3,823,000 | 2,128,833 | 55.7 |

It is expected that the October shipments will be not less than 3,000,000 bushels. The receipts of wheat from the interior at San Francisco for the three months were: 1876, 7,879,333; 1875, 5,231,000; increase, 2,648,333 bushels, or 50.6 per cent.

For the week ending Oct. 7 receipts and shipments of grain of all kinds are reported as follows, in bushels:

| | 1876. | 1875. | Increase. | P. c. |
|---|---|---|---|---|
| Lake ports' receipts | 6,476,942 | 4,977,592 | 1,499,350 | 30.0 |
| " " shipments | 4,660,252 | 4,193,258 | 466,994 | 11.1 |
| Atlantic ports' receipts | 4,093,195 | 3,179,589 | 913,606 | 28.7 |

Of the shipments from lake ports, 35⅓ per cent. was by rail in 1876, 31¼ in 1875 and 9¾ in 1874.

Chicago receipts and shipments for the week ending Oct. 14 were:

| | 1876. | 1875. | Increase. | P. c. |
|---|---|---|---|---|
| Receipts | 3,343,474 | 2,032,632 | 1,310,842 | 64.5 |
| Shipments | 2,441,535 | 1,680,151 | 761,384 | 45.3 |

Corn formed more than half and wheat nearly a quarter of the total receipts.

### Lake and Canal Rates.

These rates have again advanced. Lake rates, however, since our last report were lower for several days by a quarter of a cent. This week, however, they have risen and are quoted Tuesday at 4½ cents per bushel for corn and 5 cents for wheat

from Chicago to Buffalo, while canal rates are 7½ for corn and 8 for wheat from Buffalo to New York.

## Railroad Traffic.

The freight traffic of the Utah Central and Southern roads for September was as follows:

| | 1876. | 1875. | Increase. | P. c. |
|---|---|---|---|---|
| Utah Central, tons | 10,511 | 10,351 | 160 | 1.5 |
| Utah Southern | 9,525 | 6,248 | 3,277 | 52.4 |
| Total | 20,036 | 16,599 | 3,437 | 20.7 |

The principal item of freight on the Central was 3,363 tons coal and coke; on the Southern, 3,714 tons ore and bullion. The Southern is also getting a rapidly increasing traffic in iron ore, of which 840 tons were carried in September.

## Railroad Earnings.

Earnings for various periods are reported as follows:

*Year ending Aug. 31:*

| | 1875-76. | 1874-75. | Inc. or Dec. | | P. c. |
|---|---|---|---|---|---|
| Portland & Rochester | $138,270 | $153,931 | Dec.. | $15,661 | 10 2 |
| Expenses | 116,207 | 131,761 | Dec.. | 15,554 | 11.8 |
| Net earnings | $22,063 | $22,170 | Dec.. | $107 | 0.1 |
| Earnings per mile. | 2,634 | 2,932 | Dec.. | 298 | 10.2 |
| Per cent. of exps.. | 84.03 | 85.61 | Dec.. | 1.58 | 1.8 |

*Nine months ending Sept. 30:*

| | 1876. | 1875. | Inc. or Dec. | P. c. |
|---|---|---|---|---|
| Atchison, Topeka & Santa Fe | $1,746,816 | $1,004,233 | Inc .. | $742,583 | 73.9 |
| Burlington, Cedar Rapids & Northern | 831,234 | 936 570 | Dec.. | 105,336 | 11.2 |
| Cairo & St. Louis | 196,448 | 196,689 | Dec.. | 241 | 0.1 |
| Canada Southern | 1,266,245 | 843,992 | Inc .. | 422,253 | 50.1 |
| Central Pacific | 13,143,166 | 12,567,044 | Inc .. | 576,122 | 4.6 |
| Chicago & Alton | 3,679,098 | 3,402,654 | Inc .. | 276,444 | 8.1 |
| Chi., Milwaukee & St. Paul | 5,861,570 | $5,606,558 | Inc .. | $255,012 | 4.5 |
| Cin., Lafayette & Chicago | 281,658 | 292,111 | Dec.. | 10,453 | 3 6 |
| Denver & Rio Gra'de, Main Line | 293,675 | 265,000 | Inc .. | 28,675 | 10.8 |
| Hannibal & St. Joseph | 1,397,169 | 1,166,580 | Inc .. | 230,589 | 19.8 |
| Illinois Central | 5,248,761 | 5,533,522 | Dec.. | 284,761 | 5.1 |
| Indianapolis, Bloom. & Western | 1,117,691 | 935,824 | Inc .. | 181,867 | 19.4 |
| International & Gr't Northern | 857,704 | 831,112 | Inc .. | 26,592 | 3.2 |
| Louisville & Nashville | 3,657,671 | 3,346,346 | Inc .. | 311,325 | 9.3 |
| Midland, of Canada | 201,088 | 217,926 | Dec.. | 16,888 | 7.8 |
| Michigan Central | 5,061,409 | 4,810,755 | Inc .. | 250,654 | 5.2 |
| Missouri, Kansas & Texas | 2,260,650 | 2,003,509 | Inc .. | 257,141 | 12.8 |
| Ohio & Mississippi | 2,718,424 | 2,419,506 | Inc .. | 298,919 | 12.4 |
| St. Louis, Alton & Terre Ha'te—Belleville Line | 344,790 | 402,993 | Dec.. | 58,203 | 14.4 |
| St. Louis, Iron Mountain & Southern | 2,625,133 | 2,486,923 | Inc .. | 138,210 | 5.6 |
| St. Louis, Kansas City & Northern | 2,263,490 | 1,884,299 | Inc .. | 379,191 | 20.1 |
| Toledo, Peoria & Warsaw | 1,074,613 | 755,639 | Inc .. | 318,974 | 42.2 |

*Eight months ending Aug. 31:*

| | | | | | |
|---|---|---|---|---|---|
| St. Louis & Southeastern | $699,045 | $620,023 | Inc .. | $79,022 | 12.7 |
| Expenses | 583,393 | 566,120 | Inc .. | 17,273 | 3.1 |
| Net earnings | $115,652 | $53,903 | Inc .. | $61,749 | 114.6 |
| Per cent. of expe.. | 83.34 | 91.31 | Dec.. | 7.97 | 8.7 |

*Month of September:*

| | | | | | |
|---|---|---|---|---|---|
| Atchison, Topeka & Santa Fe | $254,024 | $162,890 | Inc .. | $91,134 | 55.9 |
| Baltimore & Ohio | 1,608,808 | ..... | ..... | ..... | ... |
| Burlington, Cedar Rapids & Northern | 90,800 | 117,928 | Dec.. | 27,128 | 23.0 |
| Cairo & St. Louis | 23,703 | 29,886 | Dec.. | 6,183 | 20.7 |
| Canada Southern | 158,618 | 117,109 | Inc .. | 41,509 | 35.4 |
| Central Pacific | 1,686,000 | 1,567,622 | Inc .. | 118,378 | 7.6 |
| Chicago & Alton | 517,932 | 490,283 | Inc .. | 27,649 | 5.6 |
| Chi., Milwaukee & St. Paul | 646,150 | 741,206 | Dec.. | 95,056 | 12.8 |
| Cin., Lafayette & Chicago | 34,040 | 41,726 | Dec.. | 7,686 | 18.4 |
| Denver & Rio Gra'de, Main Line | 32,470 | 29,266 | Inc .. | 3,204 | 10.9 |
| Denver & Rio Gra'de, Trinidad Extension | 13,559 | ..... | ..... | ..... | ... |
| Hannibal & St. Joseph | 183,000 | 154,634 | Inc .. | 28,366 | 18.3 |
| Illinois Central | 623,057 | 718,101 | Dec.. | 95,044 | 13.2 |
| Indianapolis, Bloom. & Western | 121,378 | 143,784 | Dec.. | 22,406 | 15.6 |
| International & Gr't Northern | 133,426 | 88,990 | Inc .. | 44,436 | 49.9 |
| Louisville & Nashville | 488,393 | 444,832 | Inc .. | 43,561 | 9.8 |
| Michigan Central | 622,526 | 620,814 | Inc .. | 1,712 | 0 3 |
| Missouri, Kansas & Texas | 324,144 | 291,827 | Inc .. | 32,317 | 11.1 |
| Ohio & Mississippi | 330,111 | 341,060 | Dec.. | 10,949 | 3.2 |
| St. Louis, Alton & T. H., Belleville Line | 44,589 | 48,710 | Dec.. | 4,121 | 8.5 |
| St. Louis, Iron Mt. & So | 374,000 | 333,776 | Inc .. | 40,224 | 12.1 |
| St. Louis, Kan. City & No | 290,601 | 246,624 | Inc .. | 43,977 | 17.8 |
| Toledo, Peoria & Warsaw | 145,028 | 123,894 | Inc .. | 21,134 | 17.1 |
| Toledo, Wabash & Western | 411,262 | 342,179 | Inc .. | 69,083 | 20.2 |

*First Three Weeks in September:*

| | | | | | |
|---|---|---|---|---|---|
| St. Louis & Southeastern | $77,437 | ..... | ..... | ..... | ... |

*First week in October:*

| | | | | | |
|---|---|---|---|---|---|
| Atchison, Topeka & Santa Fe | $65,539 | $43,249 | Inc .. | $22,290 | 51.6 |
| Chicago, Milwaukee & St. Paul | 134,000 | 226,589 | Dec.. | 42,589 | 18.8 |
| Denver & Rio Gra'de, Main Line | 7,187 | 6,776 | Inc .. | 411 | 6.0 |
| Denver & Rio Gra'de, Trinidad Extension | 2,522 | ..... | ..... | ..... | ... |
| Michigan Central | 150,861 | 145,306 | Inc .. | 5,555 | 3.8 |
| Ohio & Mississippi | 96,260 | 82,463 | Inc .. | 13,797 | 16.7 |
| St Louis, Iron Mt. & Southern | 100,000 | 87,432 | Inc .. | 12,568 | 14.4 |

*Week ending Sept. 22:*

| | | | | | |
|---|---|---|---|---|---|
| Great Western, of Canada | £20,260 | £17,793 | Inc .. | £2,467 | 13.9 |

*Week ending Sept. 23:*

| | | | | | |
|---|---|---|---|---|---|
| Grand Trunk | £38,000 | £41,100 | Dec.. | £3,100 | 7.5 |

## ANNUAL REPORTS.

### Western Union Telegraph.

The annual report of this company for the year ending June 30, 1876, shows that at the close of the year the company worked 73,532 miles of line, with 183,832 miles of wire and 7,072 offices. There was during the year an increase of 699 miles of line, or 0.9 per cent.; of 4,337 miles of wire, or 2.4 per cent., and of 507 offices, or 7.7 per cent. There were in use at the close of the year 8,437 sets of instruments for reading by sound, 18 printing instruments, 1,729 recording instruments, 11,101 relay magnets, 11,365 transmitting keys, 253 repeaters, 4,328 switchboards, 4,133 cut-offs, 3,201 lightning arresters and 93,819 cells of battery.

Since the close of the year the company has acquired by purchase or lease the lines of the Southern & Atlantic Telegraph Company, including 2,329 miles of line, 3,778 miles of wire and 105 offices; and the lines of the American Telegraph Company, of Michigan, including 430 miles of line and 41 offices.

The capital stock is $41,073,410, of which $7,272,235 is held by the company itself, leaving $33,801,175 outstanding. During the year $13,700 were issued in exchange for stock of companies whose lines are leased. The bonded debt, less sinking funds, amounts to $6,332,119. The capital stock outstanding is at the rate of $460 per mile of line and $185 per mile of wire; the funded debt $86 per mile of line and $34 per mile of wire.

The number of messages and average receipts were as follows:

| | 1875-76. | 1874-75. | Inc. or Dec. | P. c. |
|---|---|---|---|---|
| Number of messages | 18,729,867 | 17,153,710 | Inc .. | 1,575,857 | 9.2 |
| Average gross receipt per message | 50.9 cts. | 54.0 cts. | Dec.. | 3.1 cts. | 5.7 |
| Average expense per message | 33.5 " | 35.0 " | Dec.. | 1.5 " | 4.3 |
| Average net receipt per message | 17.4 " | 19.0 " | Dec.. | 1.6 " | 8.4 |

The earnings and expenses for the year were as follows:

| | 1875-76. | 1874-75. | Inc. or Dec. | P. c. |
|---|---|---|---|---|
| Receipts from all sources | $10,034,983 66 | $9,564,574 60 | Inc. | $470,409 06 | 4 9 |
| Expenses | 6,635,473 69 | 6,335,414 77 | Inc. | 300,058 92 | 4.7 |
| Net earnings | $3,399,509 97 | $3,229,159 83 | Inc. | $170,350 14 | 5.2 |
| Per cent. of exp's. | 66.12 | 66.24 | Dec. | 0.12 | 0.2 |

There were expended for repairs of line $563,847.32; for reconstruction, $386,779.35, and for new instruments and apparatus, $95,460.71, all being included in working expenses.

Approximate general averages for the last year were: Gross earnings per mile of line, $137.12; per mile of wire, $55.24; net earnings per mile of line, $46.45; per mile of wire, $18.71. Rates have been generally lower than in the preceding year.

The income account for the year was as follows:

| | | |
|---|---|---|
| Net earnings | | $3,399,509 97 |
| Interest on bonds, sinking funds and dividends (7½ per cent) | | 2,458,007 08 |
| Balance | | $941,502 89 |
| Construction of new lines | $594,001 43 | |
| Payment of liabilities of previous year | 333,759 87 | |
| | | 927,761 30 |
| Net balance | | $13,741 59 |

Four quarterly dividends were declared from the earnings of the year, three of 2 per cent. each, and one of 1¼ per cent., making 7½ per cent. in all. All interest was paid and the full amount carried to the sinking funds.

## THE SCRAP HEAP.

### Railroad Manufactures.

At the annual meeting of the Pennsylvania Steel Company in Philadelphia last week the production of steel rails for the year just closed was reported at 43,176 tons. A semi-annual dividend of 3 per cent., payable Oct. 16, was declared. The old officers were re-elected, as follows: President, Samuel M. Felton; Secretary, Eben F. Barker; Treasurer, Henry C. Spackman; Superintendent of Works, Luther S. Bent. The gross amount of sales was over $3,000,000, and the average price received was over $65 per ton.

H. S. Hopkins, of St. Louis, has contracts for building all the bridges on the Missouri & Western road, and for building machine shops, round-houses and other buildings for the St. Louis, Iron Mountain & Southern road at De Soto, Mo.

The Kellogg Bridge Company, at Buffalo, N. Y., has just completed two iron light-houses to be erected in Delaware Bay. The works are now engaged on six spans of iron bridge for the Western Counties Railway of Nova Scotia, and three spans, each 164 feet long, to cross the Chemung River at Corning, N. Y., on the Syracuse, Geneva & Corning road.

The American Bridge Company, of Chicago, has taken the contract for the superstructure of the Des Moines River bridge at Keokuk, Ia. The same company has already the contract for the piers, which are nearly completed.

The Brooks Locomotive Works, at Dunkirk, N. Y., are building narrow-gauge engines for the Mount Sterling, the Fond du Lac, Amboy & Peoria, and the Emlenton & Shippensville roads.

Escanaba Furnace, at Escanaba, Mich., was sold at public sale recently and bought by A. B. Meeker, of Chicago, for $105,000. The purchase includes, besides the furnace and a number of tenements and other buildings, a large tract of woodland.

The committee appointed by the creditors of the Milwaukee Iron Company report that the claims against the company aggregate $927,840.59, of which $458,427.81 is secured. The contingent claims, indorsements on discounted paper, etc., amount to $202,849.26. The assets are figured at $536,956.71, leaving an apparent but not now available surplus of $78,524, the contingent claims being excluded from the calculation. It is said that proceedings in bankruptcy will be begun.

The Milwaukee Bridge & Iron Works, at Milwaukee, Wis., have contracts for a street bridge in Chicago; five bridges for the Wisconsin Central road; three for the Pennsylvania Company, and a 300-ft. draw-span for the Minnesota River.

The East St. Louis Iron Company's mill at East St. Louis, Ill., has been remodeled and improved and now contains six puddling furnaces, eight heating furnaces, one 20-inch 3-high rail train, with blooming rolls, one 14-inch train 2-high, for making rails from 8 to 26 lbs. per yard, one 18-inch puddle train, one squeezer and the necessary shears and machinery. The capacity of the mill is 100 tons per day. The company can turn out rails of any size from 8 to 72 pounds per yard and claims that, by the reheating process, it can make perfectly welded iron rails.

The Thomas Iron Company recently started up its two furnaces at Lock Ridge and also two of those at Hockendauqua, Pa.

Some trouble has been caused at the Passaic Rolling Mill in Paterson, N. J., by the refusal of some of the men to accept a reduction in wages. The matter has been finally settled, the men continuing work at the reduced rates.

The employes of the Watson Manufacturing Company, of Paterson, N. J., have met and appointed a committee to see what can be done towards securing the wages due them at the time the Receiver was appointed.

### Fast Time on a Southern Road.

On Sept. 30 a train on the Montgomery & Eufaula road made the run of 81 miles from Eufaula to Montgomery in two hours and ten minutes, being an average of 37.4 miles per hour. The time from Pike Road to Montgomery, 16 miles, was 21 minutes, including time necessary to stop and back up to the depot. The train was composed of six coaches; the engine has 13¼ by 22 in. cylinders and drivers 5 ft. diameter.

## RAILROAD LAW.

### Mortgages Covering Land Grants.

The cases of Wilson against Boyce and others, decided by the United States Supreme Court at its recent term, were suits brought by plaintiff to recover possession of a large tract of land claimed by him under a conveyance executed by the trustees under a certain mortgage executed by the Cairo & Fulton Railroad Company in 1857. Defendant's claims rested under conveyances from the State of Missouri, which State sold the lands on account of non-payment by the company of interest upon loans of $650,000 in all made by the State under acts passed by the Legislature in 1855 and 1857. The case turned on the interpretation of those statutes, which provided that the State loans should be a mortgage upon the road and appurtenances, and upon all the property of the company. The Court decided in favor of the defendants, holding:

1. The generality of the language of the act was no objection to the validity of the mortgage. A deed or mortgage of "all my property" is sufficient to pass title.

2. It was quite within the power of the railroad company to mortgage its lands not used for the road or appurtenances.

The Court therefore held that the State lien, as set forth in the acts referred to, was paramount and prior to that of the mortgage made by the company to the trustees, and the foreclosure of the State lien destroyed any title arising under the subsequent mortgage. The plaintiff must be held to have bought with the knowledge of the prior lien, and his title is is not good as against that of defendant's.

### Negligence of an Employe Resulting in Injury to Himself.

In Campbell against the Atlanta & Richmond Air Line, appeal from Gwinnett Circuit Court, the Georgia Supreme Court recently held:

1. An employe of a railroad company, suing the company for a personal injury sustained from negligent performance of an act in which he participated, has not made a *prima facie* case for recovery, without proving, either that he was wholly free from fault himself, or that there was negligence on the part of his fellow servants. If he rests on a presumption of negligence without actual proof thereof, that presumption applies to him with the same force as to others who participated in the same act of common duty, and to get the benefit of the presumption as applied to the others, he must rebut it so far as it applies to himself. * * * * * *

3. The evidence in the present case fails to establish, affirmatively, either basis of recovery: It leaves the plaintiff's diligence unvindicated, and it fixes no negligence on others.

Judgment reversed.

### Foreclosure as Affecting Previous Contracts—Exclusive Contract with Telegraph Company.

In the Western Union Telegraph Company against the Atlantic & Pacific Telegraph Company, the Ohio Court of Common Pleas held as follows: In an agreement between a railroad and telegraph company, for the construction and operation of a line of telegraph, wherein the former is designated as the Cincinnati & Indianapolis Junction Railroad Company, but the road referred to as belonging to it, and concerning which the agreement is made, in fact belongs to the Junction Railroad Company, and the agreement is signed by the president and sealed with the corporate seal of the Junction Railroad Company, and that Company enters upon and receives performance of the agreement, the words "Cincinnatti & Indianapolis" may be rejected as surplusage, and the agreement held binding upon the Junction Railroad Company. If the railroad afterwards be sold under forclosure, the telegraph not being a party, to a new company having constructive notice of the agreement, and this company continues for several years to receive and enjoy performances on the part of the telegraph company, which expends considerable sums upon the faith that the agreement has been sanctioned and adopted, such agreement is binding upon the new company, although it may not run with the land, and although the mortgage under which the sale upon foreclosure is made was prior in date to to the agreement. The agreement by the railroad company granted the exclusive right of way for construction of the lines of telegraph, and bound the railroad company to transport and deliver wherever along the road materials were needed in such construction, operation or repair of the telegraph lines, but bound it not to deliver, except at regular stations, for any competing line. *Held*, that equality being the duty of the railroad company in its relations to the public as carrier, this stipulation was against public policy, but that the use of its right of way for the purpose of erecting a line of telegraph, not concerning it in those relations, nor interfering with the interests of transportation, the exclusive grant of such use would be enforced.

## OLD AND NEW ROADS.

### Baltimore & Ohio.

At the regular meeting of the directors in Baltimore, Oct. 11, it was resolved to declare the usual dividend of 5 per cent. from the earnings of the past half year on the stock of the Main Stem. It was also resolved that it was inexpedient to declare any dividend on the stock of the Washington Branch, in view of the continued claim of the State of Maryland for the tax of 20 per cent. of the gross earnings. The board also listened to an address from President Garrett.

In this speech Mr. Garrett stated the revenue for September, including that of the Pittsburgh Division, to have been $1,608,808, and $205,773 greater than the August earnings, but he did not compare these earnings with those for September last year. The returns he considered very satisfactory in view of the low rates. He referred to the New York conference of railroad officers, and said that Vice-President King attended it "for the purpose of aiding in establishing remunerative rates." It seems that it was expected that the New York Central would be represented, but it was not. Mr. Garrett said of the proceedings of the meeting:

"Statements were made on behalf of the New York Central that the representatives of the other trunk lines had been misinformed as to the supposed demand of the New York Central road to make equal rates from the centres of western commerce to the seaboard cities, irrespective of distances, but as, after consuming the time of the officers who attended this conference, there was no practical evidence that the New York Central road had abandoned what was understood to be its policy, the conference necessarily proved fruitless. It was clearly shown that the western connections of the New York Central road felt that the interests of their stockholders and bondholders were being literally immolated by a policy which time will certainly show to be capricious, as contrary to common sense as to long-established principles, and impossible to be maintained. It was evident that they were entirely dissatisfied with the policy of the New York Central, and they plainly showed a wise anxiety to bring about a restoration of rates to a remunerative standard."

### Philadelphia & Reading.

The Philadelphia correspondent of the New York *Bulletin* writes as follows:

"The Reading Railroad is making considerable progress in its experiments which are being made over some of the Western through freight lines on through bills of lading for grain shipped from the Western grain centres to this port for shipment. It has just completed the delivery on board shippers' vessel a cargo of corn at the Richmond docks, which were lately remodeled for discharging grain instead of coal. This shipment came in part via Anchor Line from Erie over the Reading road and its connections, instead of via Buffalo and the Lehigh Valley, as was originally proposed. There may be considerable significance in this change of route; as it was originally proposed to utilize Erie's third rail and the Lehigh Valley Railroad by the North Shore freight line. This change is thought to have been in consequence of the ill-feeling engendered between the Reading and the Lehigh Valley at the time of the collapse of the Coal Combination, since when

there has been no disposition to co-operate in securing the grain trade. Reading seems, therefore, resolved to bring its grain by another route—via Williamsport and Reading, instead of Allentown—thus giving its own line double the mileage, while depriving the Lehigh Valley of the traffic entirely, as its other connection—the North Pennsylvania—has no transfer docks for grain."

As to get grain from Erie the Reading must receive it from a line worked by the Pennsylvania Railroad Company, the prospect of developing a considerable business from that port will probably depend upon the Pennsylvania's will.

## New York, Boston & Montreal.

A suit growing out of the attempt of this company to secure an entrance into New York City under the charter of the Central Underground Railroad was brought before the New York Supreme Court this week by Oliver W. Barnes, who was President of the Central Underground Company, and sold a controlling interest therein to parties interested in the New York, Boston & Montreal. He claims that he did not receive all the consideration offered and accordingly brought suit to recover damages for breach of contract. Among other transactions brought out on the trial, it appears that the New York, Boston & Montreal parties at one time advanced $25,000 to be used in securing some legislation on the Underground charter. For this they were paid in Underground stock, for which they afterward received cash from their own company.

After the close of the testimony the Court ordered a non-suit on the grounds that the original contract between Barnes and Brown and Seligman was void for two reasons:

*First*—It purported to convey the right of Barnes in a contract to build a road of which he was President, which was against public policy and void.

*Second*—The agreement to transfer the control of the board of directors from Barnes to Brown affected the rights of the minority of the stockholders, and was against public policy and void.

The case, it is said, will now go to the General Term.

## Lockport & Buffalo.

A contract for grading the first section of six miles of this road has been let to Michael Lalley, of Lockport, N. Y. The remaining seven miles will be let soon. A contract for ties from Canada has also been let. The road is to run from Lockport, N. Y., southwest 13 miles to Tonawanda, where it will connect with the Niagara Falls Branch of the Erie.

## Burlington & Northwestern.

The third or 3 ft. gauge rail on the Burlington, Cedar Rapids & Northern road for the use of this road has been laid from Burlington, Ia., to the junction at Mediapolis, and the independent track has been laid from Mediapolis westward five miles. Work is in progress on the 14 miles required to reach Winfield.

## The Winter Time Table Meeting.

The annual meeting of railroad officers to prepare a winter schedule for the through lines was held in New York, Oct. 11. Mr. E. S. Flint, of the Cleveland, Columbus, Cincinnati & Indianapolis, presided, and Mr. W. F. Allen, of the *Official Guide*, acted as Secretary. The question of time-tables was referred to a committee of 15, which subsequently reported a schedule differing but little from that of last winter, which was adopted.

## Dividends.

Dividends have been declared by the following companies:

Panama, 3 per cent., quarterly, payable Oct. 16.

Baltimore & Ohio, 5 per cent., semi-annual, payable Nov. 1. Transfer books will be closed from Oct. 20 to Nov. 1.

## Railway Mail Service Compensation.

The Railway Mail Service Commission, after concluding its sessions in Atlanta, went north again to Indianapolis. At a session held there Oct. 11 a hearing was given to several railroad officers and merchants of the city, and the local post-office authorities were examined. The general feeling was in favor of a restoration of the fast mail system.

The commission met again in St. Louis, Oct. 13, where the local officers of the department and some merchants testified in favor of the fast mail trains. On Oct. 14, Superintendents Lyford, of the Kansas Pacific; McKissock, of the St. Louis, Kansas City & Northern; Rogers, of the Atlantic & Pacific; and Mead, of the Missouri Pacific, made statements. The general opinion was that the compensation received by their roads for carrying the mails was entirely insufficient. Mr. Mead thought that the car space occupied would be the fairest basis of payment, and that the mails now paid much less than express matter.

## Railway Mail Service Mutual Benefit Association.

The annual meeting of this association was held in St. Louis, Oct. 12. The President, Mr. A. J. Miller, made an address setting forth the objects and benefits of the association. There were at the close of the year 1,055 members and a balance of $1,850.59 in the treasury. During the last year about $4,000 had been paid in assessments, and the same amount paid out to the representatives of seven deceased members.

The meeting was afterwards addressed by all the members of the Railway Mail Service Commission, who were then in the city. The rest of the proceedings were of the usual routine character.

## Oregon Pacific.

A bill introduced into the Oregon Legislature on behalf of this company provides that the company shall build a line from Portland, Oregon, to a junction with the Union Pacific, in consideration whereof the State shall pay the company a subsidy of $24,000 per annum for 20 years for each section of 20 miles of said road within the State. As security for the completion of the road outside of the State, the State is to retain one-half the subsidy for each section of 20 miles until a corresponding section of 20 miles beyond the State line is finished. The State is also to agree not to undertake any regulation of fares or freights over the road.

It is said that the bill has very little chance of passing, at any rate in its present shape. Besides a strong anti-subsidy feeling it has to meet the opposition of several other projects which are asking for State aid.

## Great Western, of Canada.

A London dispatch says that at a special meeting of the stockholders in that city, Oct. 12, the project of amalgamating with the Grand Trunk Railway was duly considered, the proposition being finally rejected by an overwhelming majority. The proposition was that the Great Western Railway should pay to the Grand Trunk line the sum of £225,000 as rental for the use of the whole of the latter's lines west of Toronto, including the Buffalo & Lake Huron, the International, and the St. Clair ferries. Mr. Childers, the President of the road, in a long speech, severely condemned a series of what he termed discreditable acts of the Grand Trunk Railway, and denounced it as the Ishmael of American railway lines.

## Grand Trunk.

The resignation of the presidency of the company by Mr. Richard Potter is said to have been entirely unexpected and to have caused much comment in London. It is thought to have been made with the intention of affecting the action of the Great Western stockholders on the question of the partial amalgamation of the companies.

## Chicago, Burlington & Quincy.

This company having ordered a reduction in the wages of trainmen, a number of the men met at Galesburg, Ill., Oct. 12, and appointed a committee to remonstrate with the officers of the road and to demand a return to the old rate of wages.

The rolling stock of the company is fully employed, and a considerable number of new cars has been ordered to the Aurora shops.

## Fitchburg.

Negotiations are said to be pending between this company, the Erie and the Delaware & Hudson Canal Company for the formation of a new through line from Boston to the West by the Hoosac Tunnel, Albany, Binghamton and the Erie to Buffalo. The plan also includes the delivery of coal from the Delaware & Hudson Canal Company's lines to New England points by way of the Hoosac Tunnel line. The officers of the companies interested recently passed over the Tunnel line on a special train.

## St. Louis & Southeastern.

The Auditor's statement for August is as follows:

| | St. Louis Div. | Kentucky Div. | Tenn. Div. | Whole road. |
|---|---|---|---|---|
| Total earnings..... | $53,244 41 | $34,984 92 | $13,736 93 | $101,966 26 |
| Working expenses. | 41,556 30 | 32,231 94 | 11,755 47 | 85,543 71 |
| Net earnings..... | $11,688 11 | $2,752 98 | $1,981 46 | $16,422 55 |
| Per cent. of exp'ses. | 78.11 | 92.09 | 85.81 | 83.87 |

For the whole road the gross earnings were $292, and the net earnings $47 per mile for the month.

## New Orleans, Mobile & Texas.

Notice is given to holders of the bonds issued by the New Orleans, Mobile & Chattanooga Railroad Company and New Orleans, Mobile & Texas Railroad Company, secured by two deeds of trust or mortgage, dated respectively March 15, 1870, and Jan. 1, 1872, who have not become parties to the act of incorporation of the New Orleans & Texas Railroad Company, that they are required to make their election to join the said company or take their *pro rata* portion of their bonds in money, according to the terms and conditions of Article 5 of the charter thereof and the decree of the court. Messrs. L. P. Morton, Henry Morgan and William Mertens are the committee of bondholders.

## Omaha & Republican Valley.

Saunders County and the other counties interested having voted the subsidies asked for, work has been begun on this road, which is to run from the Union Pacific at Waterloo Valley, Neb., (31 miles from Omaha) southward through Saunders, Butler and Polk counties. The terms of the Saunders County vote require 35 miles to be completed by Jan. 1. It is built and will be worked as a branch of the Union Pacific.

## Manchester & Keene.

There has been much trouble with the workmen on this road, the contractors having suspended work and discharged the men without paying them the wages due. Most of the men were thus left destitute, unable either to support themselves or to get away to other places. The matter was finally settled by the towns which hold stock in the company, agreeing to cash the contractors' due-bills at 10 per cent. discount, which offer nearly all the men accepted. The contractors claim that the company failed to pay them as agreed, leaving them without money to meet their own obligations.

## East Berlin Branch.

Tracklaying has been begun on this road, which is to run from East Berlin, Pa., southward six miles to a junction with the Hanover Junction, Hanover & Gettysburg road. All the iron has been bought and is on hand.

## Bedford, Brownstown & Madison.

Madison township, Ind., has voted to levy a tax of $110,000 in aid of this projected road.

## Cincinnati & Martinsville.

Arrangements have been completed to reopen this road, which was closed to traffic some months since. Trains were to begin running over the road Oct. 18.

## Cincinnati & Eastern.

This road is now completed from the crossing of the Little Miami road at Plainsville, O., eastward to Batavia, about 15 miles, and trains were to begin running over this section Oct. 16. From Batavia eastward to Winchester, 30 miles, the track is being laid as fast as possible, in order to complete that section before winter.

## Montclair & Greenwood Lake.

Suit has been begun in the United States Circuit Court by Wm. A. Guest to set aside the foreclosure of the first and second mortgages and the sale of the road under the foreclosure decrees. Mr. Guest was a large creditor of the old Montclair Company and bought the interest of the stockholders in the road at a sale made by order of the New Jersey Court of Chancery, April 4, 1874.

## Boston & Albany.

The following petition to the directors is being circulated:

"The undersigned, patrons of the Boston & Albany Railroad, request you to reduce your rates for passengers to two cents per mile, and local freight rates 25 per cent.; believing as we do that the greatly reduced rates for labor and all materials used by your railway, together with the increase of travel owing to a reduction in fares, will enable you to continue your present rate of dividends to your stockholders. Should there be a deficiency, we respectfully suggest that your present surplus funds of upwards of three million six hundred thousand be used to supply such deficiency."

## Ogdensburg & Lake Champlain.

A St. Albans (Vt.) dispatch of Oct. 16 says: "This morning the Ogdensburg & Lake Champlain Railroad Company seized its road from the Central Vermont Company for non-payment of rent. Wm. J. Averill, of Ogdensburg, was appointed by the Supreme Court of New York Receiver of the property, and he appointed John C. Pratt, President of the company, General Manager. The Central Vermont officers have notified their employes to obey the Receiver. At present, and until some other arrangement is made, they will transfer passengers, baggage and freight at Rouse's Point."

The road, which runs from Ogdensburg, N. Y., eastward to Rouse's Point, 118 miles, has been worked since 1870 by the Vermont Central trustees and their successor, the Central Vermont Company, under a so-called agreement, which is really a lease.

## Erie.

The Receiver's report for July, as filed by the referee, is summed up as follows:

| | |
|---|---|
| Balance, July 1..... | $429,020 40 |
| Receipts for the monthh..... | 1,764,591 08 |
| Total..... | $2,193,611 48 |
| Disbursements on all accounts..... | 1,804,846 10 |
| Balance, Aug. 1..... | $388,765 38 |

The disbursements were in excess of the receipts by $40,255.02. No Receiver's certificates were issued during the month, but $165,000 were canceled, leaving $1,270,000 outstanding Aug. 1.

## Philadelphia & Atlantic City.

Surveys have been made for this projected narrow-gauge road, and it is said that arrangements are now being made to begin work on the grading, most of which will be light. The line begins at Dry Inlet, just below Atlantic City, N. J., and runs in a very direct line to Camden. The terminus in that city is at the foot of Division street, whence a ferry will run across the Delaware to Philadelphia. Some trouble is anticipated in securing the entrance into Camden. The road, if built, will be parallel and close to the Camden & Atlantic, and through a country which cannot well support two railroads.

## St. Louis, Lawrence & Western.

St. Louis papers report that the Kansas courts have appointed Mr. George H. Rea, of St. Louis, Receiver, on application of the creditors. Mr. Rea will give his personal attention to the management of the line.

The road, which was formed by the consolidation of the St. Louis, Lawrence & Denver and the St. Lawrence & Southwestern, extends from the Missouri Pacific at Pleasant Hill, Mo., westward through Lawrence to Carbondale, Kan., 93 miles.

## Portland, Salt Lake & South Pass.

Chief Engineer Chapman has completed the location of this road (late the Portland, Dalles & Salt Lake) from Corinne, Utah, to Malade City, Idaho, 50 miles. This section is now under contract, and work has been begun at Corinne. Mr. Chapman reports the route through the Malade Pass not only practicable, but easy of construction, with one grade of 90 feet to the mile and no other over 70 feet.

## Central Pacific.

For some time past this company has been suing Mr. A. A. Cohen, formerly an agent but lately a very active opponent of the company, on account of some of the transactions of his agency. The suit has been very long, an enormous mass of testimony having been taken, much of it relating to the inside workings of the company. In San Francisco, Oct. 12, the end of the suit was reached, the Court giving a verbal decision in favor of Cohen, and promising a written decision in a few days.

## Red River & Rio Grande.

It is said that parties interested in the Missouri, Kansas & Texas have secured a controlling interest in this company, which has a Texas charter and land grant for a railroad from Sherman, Tex., southwest across the whole State to Presidio del Norte, on the Rio Grande. The project also includes an extension through Mexico, by way of Chihuahua, to a port near the mouth of the Gulf of California.

## Illinois Central.

It is said that the transfer between the North and Iowa divisions at the Dubuque Bridge will be done away with and that North Division freight trains will hereafter run through to Dubuque, instead of stopping at Dunleith. It is also said that long engine runs will be tried, freight engines running through from Amboy to Waterloo, 210 miles, the crews being changed at Dubuque.

## Tennessee Coal & Railroad.

This company, which owns a railroad from Tracy City, Tenn., southwest to a junction with the Nashville, Chattanooga & St. Louis near Cowan, 21 miles, has just completed 1¼ miles of road to some new mines just opened. The gauge is 5 feet.

## Vermont Central.

A meeting of the first and second-mortgage bondholders was held in Boston, Oct. 11, to elect a new committee to represent them under the decree of the court. The first-mortgage bondholders chose Edward D. Mandell, of New Bedford, Mass., and Otis Drury, of Boston; the second-mortgage bondholders, Francis A. Brooks, of Boston.

There was some discussion on the plan of reorganization offered by the Central Vermont Company, and Gov. J. Gregory Smith made some explanations. Several others spoke, the general drift of feeling among the bondholders being dissatisfaction with the plan on account of the priority given to the trust debt and distrust of the present management. No action as to the plan was taken.

The plan of reorganization, as prepared by the Central Vermont Company and submitted to the bondholders by the committee, consisting of T. H. Perkins, J. H. Converse and Estes Howe, is as follows:

1. The Vermont Central and Vermont & Canada railroads shall be sold to the Central Vermont Railroad Company, and that corporation is to issue securities as follows, to be offered to the security holders of the Vermont Central and Vermont & Canada railroads, in exchange for their securities, hereafter mentioned, for the space of six months after said purchase.

2. Registered or coupon bonds of the Central Vermont Railroad Company to be issued, not to exceed $7,000,000, secured by the first mortgage upon the Vermont Central and Vermont & Canada railroads and equipment appertaining thereto, and payable in 30 years from date, with interest at the rate of 6 per cent.,

*First*, To return, by exchange or otherwise, the trust bonds, known as the "Equipment," "Income and Extension" and "Guaranteed" bonds, bond for bond, according to their face, $3,912,600.

*Second*, To pay the Vermont & Canada Railroad Company $1,500,000 for their road.

And in order to provide for the retirement of the floating debt of the receivers and managers, there shall be set apart $1,587,400 balance of said $7,000,000 of bonds, which, while they shall stand equal as to security with the whole of said mortgage, shall be entitled to payment of interest out of the net income of said roads before any other security of the company up to July 1, 1879.

And in order further to provide for said floating debt, and to facilitate and expedite the payment of the same, the interest on said $5,412,600 bonds up to July 1, 1879, shall be funded into a scrip payable in ten years from the date thereof, or sooner, at the option of the company, bearing interest at the rate of 6 per cent., and all the earnings of said roads after payment of interest on said $1,587,400 of bonds, up to July 1, 1879, and of expenses of operating and maintaining the same and paying the rent of leased roads, shall be appropriated, up to July 1, 1879, to the payment and cancellation of said floating debt.

3. The present stock of the Central Vermont Railroad Company to be retired, and $1,000,000 guaranteed 6 per cent. stock to be issued for the benefit of the present Central Vermont stockholders, independent of the Rutland stock, so called, for advances, interest, etc.

4. The Central Vermont Railroad Company to issue $2,500,000 6 per cent. preferred stock, $2,000,000 to be used for the purpose of retiring the first mortgage bonds of the Vermont Central Railroad Company and to the extent that the holders of said bonds may be willing to exchange at 66⅔ per cent. of the face of said bonds, and $500,000 for the Vermont & Canada Railroad Company.

5. The Central Vermont Railroad Company to issue its common stock to the amount of $1,500,000, to be used for the purpose of retiring the second-mortgage bonds of the Vermont Central Railroad Company and to the extent that the holders of said bonds may exchange the same at 20 per cent. of the face value, and balance of said common stock to be issued to the present holders of the Central Vermont stock, independent of the Rutland stock, so called.

## Railway Passenger and Freight Conductors' Mutual Aid and Benevolent Association.

The annual meeting of this association was held in Chicago, Oct. 12, delegates from all the branches being present. The annual address, reviewing the progress of railroads, was de-

livered by Mr. W. S. Sears, of the Lake Shore & Michigan Southern road. After some discussion the limit of membership was placed at 1,050, and the annual assessment was raised from $1 to $2.50 for each member. Several amendments to the constitution were submitted and discussed. One, which was adopted, provides for an auxiliary association of 500 members, who shall have many of the privileges of full members and from whom, in the order of seniority, vacancies in the regular membership shall be filled. Some minor changes were referred to the board of directors, with power.

Mr. J. D. Dunning, of St. Louis, was chosen to deliver the annual address next year. After electing officers, the association adjourned to meet again in Chicago next October.

### Cleveland & Mahoning Valley.

The London *Railway News* of Sept. 30 says: "The holders of the 1872 Leased Lines bonds of the Atlantic & Great Western Railroad will be gratified by the announcement, made elsewhere in our columns, to the effect that the issue of bonds of the Cleveland & Mahoning Railway, recently offered to replace the maturing bonds of that company, has been taken in America at par. The subscriptions made for the issue in this country will consequently be returned; but the bondholders have the gratification of knowing that their prompt response has opened the eyes of holders in America to the value of the property, satisfactory testimony to which is afforded by the action taken by local capitalists. The success of the subscriptions will release the rental, which has accumulated since January last, and allow of its distribution among the holders of the Leased Lines bonds, who owe a debt of gratitude to the committee which has so efficiently intervened on their behalf.'

### Allegheny Narrow Gauge.

A company by this name has been organized to build a narrow-gauge road from Allegheny City, Pa., northwest to Emsworth, about six miles. It is intended for suburban traffic.

### Chicago, Danville & Vincennes.

Receiver Anderson's account for July and August is as follows:

| | | |
|---|---|---|
| Cash on hand July 1 | | $15,821 94 |
| Receipts on present account | | 175,225 43 |
| " " account of former receivers | | 393 98 |
| " " " company | | 21 00 |
| Total | | $191,462 35 |
| Disbursements on present account | $163,565 61 | |
| " " account of former receivers | 704 49 | |
| Disbursements on account of floating debt | 8,155 09 | |
| | | 172,425 19 |
| Balance, Sept. 1 | | $19,037 16 |

The receipts exceeded the disbursements by $3,215.22 for the two months.

### Bellaire & Southwestern.

This company has filed amended articles of incorporation, covering a proposed extension from Woodsfield, O., through Morgan, Noble, Washington and Athens counties to Athens.

### Bangor & Piscataquis.

Work has been progressing slowly through the season on the extension of eight miles from Abbott, Me., to Blanchard, and it is thought that it will be finished this fall.

### Waynesburg & Washington.

The directors have resolved to suspend work for the present and to do nothing towards laying the iron on the road until next spring.

### Portland & Ogdensburg.

The expected strike of the employes did not take place, the company having raised money enough to give the men one month's pay and promising to pay them regularly hereafter.

### Duxbury & Cohassett.

The adjourned convention in aid of the proposed extension of this road was held in Middleboro, Mass., Oct. 11. Several committees reported progress and there was a long discussion over the various lines proposed, but nothing definite was decided on. Committees were instructed to make a thorough local canvass and to be ready to report to an adjourned meeting to be held about Dec. 15.

### Dallas & Wichita.

It is once more said that arrangements have been completed to build 25 miles of this road out of Dallas, Tex., this year.

### Galveston, Harrisburg & San Antonio.

The present terminus at the Guadalupe River, five miles west of Seguin, Tex., has been named Marion. Work is progressing west of the Guadalupe, construction trains having crossed the river, and the iron is being laid.

### Quebec, Montreal, Ottawa & Occidental.

This road, formerly the North Shore and the Northern Colonization roads, is now completed from Montreal, P. Q., west by north to St. Jerome, about 30 miles, and this section was formally opened for travel Oct. 9.

### Southeastern, of Canada.

A considerable force is now at work on the grading of the Northern Division (formerly the Richelieu, Drummond & Arthabaska road) between Waterloo, P. Q., and Acton. The line is completed from Sutton Junction to Waterloo, and from Acton to Sorel on the St. Lawrence, leaving a gap of 26 miles, on which work is now in progress, as stated above. When finished it will give the Southeastern a branch 96 miles long in all, most of it through a fine lumber country.

### Hudson & St. Lawrence.

Some attempts having been made to sell bonds of this company to unsuspecting people, the following, from the Ballston (N. Y.) *Journal*, may be of some interest:

"In 1871 a railroad company was organized under the general law, named the Hudson & St. Lawrence Railroad Company, for the purpose of building a line from Ballston Spa to Ogdensburg. In the certificate filed in the office of the Secretary of State, by Robert L. Greene, President, a citizen of Hudson, N. Y., is given a list of the directors and stockholders of the company. In the same certificate it is also represented that 1,500 shares of stock of said company, representing $150,000, have been subscribed for in good faith, and 10 per cent. paid thereon, amounting to $15,000. In 1872, the president, directors, etc., reported as follows: 'Graduation and masonry (payment on contract), $200,000. Land, land damages and fences, $1,300. Engineering and agencies, $15,621.82. Total cost of road and equipment, $216,921.82. Length of road, 150 miles.' Since that time the company has made no report.

"In 1873 the company issued $2,500,000 6 per cent. real estate bonds, each bond of the denomination of $2,500, payable 10 years after date in cash, or, at the option of the company, in a tract of land of 80 acres, to be located in one of the counties of Saratoga, Hamilton, Oneida, Herkimer or St. Lawrence, on the line of said railroad. The bonds are secured by a pledge of all the lands that may be purchased or given to said company in the above named counties. These bonds were thrown upon the market, and the holders of them are now investigating for the purpose of ascertaining their value, and whether the company has ever made any surveys or done any work upon their proposed line, or obtained any title to lands by purchase or gift.

"Inquiries in this county and at Ogdensburg have revealed the fact that the company has never put in an appearance on the county records, or by any engineering parties, and no trace of any surveys can be found. The whole thing looks like a big swindle. The only stockholder purporting to reside in Saratoga County is John N. Grover, of Ballston. If there is or was any such man in existence he is unknown to the oldest inhabitant of Ballston."

### Vicksburg, Shreveport & Texas.

It is again reported that parties interested in the Texas & Pacific are arranging to advance the money needed to build the 90 miles of this road from its present terminus at Monroe, La., west to Shreveport. The road is now in the hands of a receiver, the sale and transfer to the North Louisiana & Texas Company having been set aside by the United States Supreme Court some time ago. It will probably have to be sold for the benefit of the bondholders before anything can be done towards the extension.

### Monday Creek.

A company by this name has been organized in Ohio to build a narrow-gauge coal road from Gore, on the Straitsville Branch of the Columbus & Hocking Valley road, northward to Anderson's, about 10 miles. The capital stock is to be $50,000.

### Wyandotte, Kansas City & Northwestern.

Meetings are being held and efforts made to raise the money required to extend this road from its present terminus at Lexington, Mo., eastward to Marshall, about 35 miles. The estimated cost is $300,000. From Marshall there is talk of a branch to run southward about 30 miles to Sedalia.

### Indianapolis, Decatur & Springfield.

A meeting of the directors was held in Indianapolis last week, when Chief Engineer Maccoughty presented a report on the present condition of the work on the unfinished section from Montezuma to Indianapolis. A number of the directors afterward started on a trip over the line.

### Central, of Georgia.

On appeal from the Georgia Supreme Court the United States Supreme Court has reversed the decision of the State Court and holds that this company is entitled to the limitation of all taxation to one-half of one per cent. of its net income, provided for in the original charter. The Supreme Court decision, after summing up the case, says:

"It is not denied that by the provisions of the charter granted in 1833, amended in 1835, and accepted by the Central Railroad & Banking Company, a contract was made that the company should not be taxed higher than one-half of one per cent. upon the net income. Nor is it denied that that the protection thus promised was as perpetual as the existence of the company itself. But it is contended on behalf of the State that the charter granted in 1833 and amended in 1835 was surrendered by the union and consolidation of the company under the act of 1872 with the Macon & Western Railroad Company, and that the company is now existing under a charter granted by the latter act. By the construction placed upon the act of 1872, however, no such union of the two companies was authorized as would work a surrender of their charter by both of them and the creation of a new company; at most, it intended a merger of the Macon & Western Railway Company into the other, a mode of transfer of that company's franchises and property, and a payment therefor with the stock of the Central Company. But this gift of new powers did not destroy the identity of the Central Company, nor did the union of the Macon & Western Company with the Central Company have the effect to exempt it from taxation, but it remained subject to all prior liabilities, the Central Company taking it then as it existed."

### Council Bluffs, Eastern & St. Louis.

A company by this name has been organized in Missouri for the purpose of building a railroad from Pattonsburg, Mo., the terminus of the St. Louis, Council Bluffs & Omaha road, northwest to Council Bluffs, Ia., about 140 miles. The road, if built, would form, in connection with the St. Louis, Kansas City & Northern, a somewhat more direct line from St. Louis to Council Bluffs than any now in existence.

### Louisville, Cincinnati & Lexington.

Receiver McLeod's September report is as follows:

| | | |
|---|---|---|
| Cash balance Sept. 1 | | $361,234 91 |
| Cash receipts during month | | 155,291 72 |
| Total | | $516,526 63 |
| Paid on audited vouchers and pay-rolls | $91,924 05 | |
| Paid for back-pay claims | 215 63 | |
| | | $92,139 68 |
| Cash balance, Oct. 1 | | $424,386 95 |

The receipts were $63,152.04 in excess of the disbursements for the month.

### Corpus Christi & Rio Grande.

It is said that this company has contracts for the iron for 25 miles of its road and that arrangements have been made to have the road in operation from Corpus Christi, Tex., to Banquete early in 1877.

### Providence & Boston.

At a recent meeting of parties interested in the projected narrow-gauge line from Boston to Providence, it was decided to adopt the line in Massachusetts passing through Brookline, West Roxbury, Dedham, Norwood, Walpole, Norfolk, Wrentham and Attleboro to the Rhode Island line near Valley Falls. This line is to the west of the Boston & Providence road. A committee was appointed to raise money for the survey and location of the line, with power to contract for such survey.

## Train Accidents in September.

Early on the morning of the 1st, a train on the Missouri Pacific road ran into a wash-out near Fairview, Mo., and 13 cars were piled up together, injuring a brakeman and killing a number of cattle.

On the 1st, a passenger train on the Lehigh Valley road was thrown from the track near Catasauqua, Pa., by the breaking of an axle under the engine. Four cars went down a bank, injuring one passenger seriously and 10 slightly.

On the afternoon of the 1st, the Cheshire express train on the Vermont & Massachusetts Division of the Fitchburg Railroad ran into the rear of a mixed train near Wachusett, Mass., wrecking the caboose and passenger car, killing one passenger and injuring three others. The conductor of the express had been warned that the mixed train was but a short distance ahead, but had, it is said, failed to notify the engineman.

On the morning of the 2d, a freight train on the Lake Shore & Michigan Southern road was thrown from the track near Dover, Mich., wrecking five cars and blocking the road several hours.

On the morning of the 2d, seven cars of a mixed train on the Port Jervis & Monticello road were thrown from the track near Port Clinton, N. Y., by a loose rail, blocking the track all day.

On the 2d, nine cars of a freight train were thrown from the track in the Ohio & Mississippi yard at Cincinnati, killing a brakeman.

On the night of the 2d a passenger train on the Toledo, Wabash & Western road ran into a drove of cattle near Blue Mound, Ill., throwing the engine and several cars from the track, injuring the engineman and a passenger.

Early on the morning of the 3d the rear section of a west-bound coal train on the Baltimore & Ohio road ran into the rear of the preceding section, which had stopped for water at Sandy Hook, Md., breaking up several coal hoppers and throwing the wreck over upon the east-bound track.

A minute later an east-bound express came up and struck the wreck of the coal hoppers. It was thrown from the track and the engine, mail, baggage and two passenger cars went down a bank 20 feet high into the Chesapeake & Ohio Canal. The engineman was caught under the engine and killed, the fireman, mail agent and seven passengers being hurt, none of them very badly.

On the 4th there was a collision between two freight trains on the Cleveland & Pittsburgh road, near Hanover, O., by which both trains were badly damaged.

On the 4th a gravel train on the Chicago, Rock Island & Pacific road ran into the head of a stock train which was standing on the track at Oxford, Ia., damaging both engines and several cars and injuring one man seriously. There was a dense fog at the time.

On the afternoon of the 4th as an engine on the Smyrna Branch of the Delaware Railroad was drawing out of the yard at Smyrna, Del., the pin connecting the throttle lever to the valve broke and the fireman, who was running the engine found he could not shut off steam. He jumped, leaving the engine alone, and it ran down at great speed to Clayton, where it jumped the track on a curve near the depot, wrecking itself badly and tearing up the platform.

On the evening of the 4th the boiler of an engine on the Baltimore & Ohio Railroad exploded in the yard at South Chicago, Ill., destroying the engine, doing some damage to adjoining buildings and killing the fireman.

On the morning of the 5th the baggage car of a train on the California Pacific road ran off the track at South Vallejo, Cal.

On the 5th a freight train on the Hannibal & St. Joseph road ran into a wash-out near Meadville, Mo., wrecking the engine and several cars, killing three men who were on the train and injuring the engineman.

On the evening of the 5th, as a train on the Houston & Texas Central road was approaching Wilson Creek bridge, near McKinney, Tex., it struck a cow, which threw the engine from the track, and before the train could be stopped it had run upon the trestle on the ties. The trestle gave way and the engine and ten cars went down into the creek, making a complete wreck, killing a brakeman, who had been but a few days on the road, and seriously injuring the fireman.

On the night of the 5th, as a special train on the Marietta & Cincinnati road having a circus on board was passing over a high bridge near Athens, O., it struck a broken switch. All of the train passed over safely but the rear car, which was full of employes of the circus, and which was thrown from the track but stopped on the bridge, the engineman being promptly signalled and the brakes put on.

Late on the night of the 5th a passenger train on the St. Louis, Kansas City & Northern road ran into a wash-out near Salisbury, Mo., wrecking several cars, killing Mr. Taussig, Treasurer of the company, two children and another passenger, and injuring 12 others, most of them slightly. The passenger killed was in the upper berth of a Pullman car, which shut up tightly, smothering him to death.

On the morning of the 6th a freight train on the New York Central & Hudson River road ran into the rear of another at East Rome, N. Y., damaging a car.

On the evening of the 6th, as a passenger train on the New York & Oswego Midland road was near Bloomingburg, N. Y., one of the cylinder heads blew out, delaying the train an hour.

On the evening of the 6th nine cars of a freight train on the Chicago & Iowa road were thrown from the track near Shabona, Ill., blocking the track twelve hours.

On the night of the 6th a freight train on the Hannibal & St. Joseph road was thrown from the track by a wash-out near Bucklin, Mo., injuring the engineman.

On the night of the 6th the engine and two cars of an express train on the Ohio & Mississippi road were thrown from the track at Sumner, Ill., by a misplaced switch, blocking the road several hours.

On the 7th the engine and two cars of a freight train on the Peoria, Pekin and Jacksonville road broke through a bridge over Panther Creek, near Chandlerville, Ill., the abutments of which had been badly washed during a storm. The engine and cars went down into the creek and were wrecked, injuring the engineman and fireman.

On the evening of the 8th the engine and two cars of a passenger train on the Buffalo & Jamestown road were thrown from the track in Buffalo, N. Y., by a switch which had been purposely misplaced. The engine went into a cattle-guard and was badly damaged.

On the morning of the 9th an express train on the Pennsylvania Railroad was thrown from the track by the breaking of a wheel on the engine truck, near Lancaster, Pa. The entire train left the track, the engine and two cars going down a bank and into an adjoining corn-field. The air-brake reservoir is said to have been broken by a large stone just after the engine left the track, so that the brake could not be applied.

On the 9th six cars of a freight train on the Wallkill Valley road ran off the track near Walden, N. Y.

On the 10th, on the Chicago, Rock Island & Pacific road, near Brighton, Ia., there was a butting collision between a west-bound freight and the first section of an east-bound train. Both engines and several cars were damaged.

A few minutes afterwards the second section of the east-bound train came up and ran into the wreck, damaging several more cars.

About noon on the 11th a passenger train on the Little Miami road ran into a freight train on the Cleveland, Columbus, Cincinnati & Indianapolis at the crossing of the two roads in Columbus, O. Several freight cars were wrecked and a baggage car damaged, blocking both roads for a time.

On the afternoon of the 11th a passenger train on the Philadelphia & Reading road ran into the rear of a coal train near the Girard Avenue crossing in Philadelphia, damaging the engine and breaking up several coal cars.

On the afternoon of the 11th the boiler of an engine on the Baltimore & Ohio road exploded near Frederick Junction, Md., wrecking the engine and killing the engineman and fireman. The road was blocked several hours by the wreck.

Early on the morning of the 12th an express train on the Richmond & Danville road was thrown from the track by a broken rail on a high bank near Reedy Fork, N. C. The engine and six cars went down the bank and were all more or less broken; 13 passengers were seriously hurt, besides a number slightly bruised.

Early on the morning of the 12th a west-bound freight train on the New York Central & Hudson River road ran into the rear of a preceding freight which had stopped to take water at Amboy, N. Y., wrecking several cars.

A few minutes later a third train came up and ran into the wreck, piling up an engine and several more cars and making a very bad wreck. There was a thick fog at the time.

Early on the morning of the 12th a freight train on the New York Division of the Pennsylvania Railroad ran into a lot of cattle near Torresdale, Pa., throwing three cars from the track.

The freight engine threw three cows over upon the east-bound track and the east-bound express from Washington, which came up just at that moment struck them. Six passenger cars were thrown from the track, the trucks being torn out from under them and the cars were somewhat damaged. The mail agent, baggage-master, conductor and one passenger were slightly hurt. All three tracks of the road were blocked four hours.

On the morning of the 13th there was a butting collision be-

tween two passenger trains on the Peoria, Pekin & Jacksonville road near Hollis, Ill., by which both engines were wrecked, several cars badly broken, a boy killed and six others badly hurt. It is said that the south-bound train should have waited at Hollis for orders, but did not do so.

On the evening of the 13th the engine and three cars of a passenger train on the Utica Division of the Delaware, Lackawanna & Western were thrown from the track by a misplaced switch at Hubbardsville, N. Y. The lever had been broken and the switch changed without altering the signal.

On the morning of the 14th, as a freight train on the Boston, Clinton, Fitchburg & New Bedford road was backing into the depot at Taunton, Mass., four cars broke loose and went off the end of the siding and through the wall of the depot, doing much damage.

On the morning of the 14th, on the Lehigh Valley road, at Hickory Run, Pa., there was a butting collision between a freight train and an extra made up of empty passenger cars. Both engines and a number of cars were wrecked. The extra was running on the freight train's time.

On the 14th two cars of a mixed train on the Mobile and Alabama Grand Trunk road were thrown from the track near Chickasabogue Creek, Ala.

On the night of the 14th a coal train on the Pennsylvania Railroad ran into a land-slide near Thompsontown, Pa., and the engine was upset, five or six cars being piled up on top of it and wrecked. The conductor was killed, the engineman and fireman badly hurt. The track was blocked all night.

Late on the night of the 14th a freight train on the Vermont Central road broke in two near Northfield, Vt., and the rear section afterwards ran into the forward one breaking four cars badly, two being thrown across the track and two down a high bank. A brakeman, who was on top of one of the cars, was thrown down the bank and killed.

Very early on the morning of the 15th the engine of a freight train on the Philadelphia & Reading road was thrown from the track by a stone which had rolled upon the track at the entrance to the tunnel at East Mahanoy, Pa.

Very early on the morning of the 15th there was a butting collision between two freight trains on the Pittsburgh, Fort Wayne & Chicago road, near Orrville, O., by which both engines were wrecked and a number of cars piled up and badly broken, blocking the road nine hours. Three tramps, who were stealing a ride, were killed and a fourth fatally hurt; the engineman and fireman of one of the trains were injured. An order had been sent by the train dispatcher to hold the west-bound train at Orrville, but was incorrectly transmitted and understood to mean that the track was clear.

On the 15th, on the Connecticut & Passumpsic Rivers road, near Passumpsic, Vt., there was a butting collision between a north-bound passenger and a south-bound freight train by which both engines were slightly damaged.

On the evening of the 15th a parlor car of a train on the Great Western Railway was thrown from the track by a broken axle near Chatham, Ont., and three passengers were hurt.

Early on the morning of the 16th a freight train on the Michigan Central road ran into the rear of a preceding freight near Jackson, Mich., wrecking an engine and six cars. There was a thick fog at the time.

Early on the morning of the 16th a freight train on the Philadelphia, Wilmington & Baltimore road ran off the track near Sharon Hill, Pa., blocking the road a short time.

On the morning of the 16th, thirteen cars of a freight train on the Chicago, Danville & Vincennes road were thrown from the track and wrecked near Hoopston, Ill., by the spreading of the rails.

On the night of the 16th there was a butting collision between two freight trains on the Illinois Midland road, near Paris, Ill., by which both engines were badly damaged.

On the morning of the 17th the engine and three cars of the Boston express on the New York Division of the Pennsylvania Railroad were thrown from the track at Bear Swamp, N. J., by a broken rail. The engine and cars were badly broken, the fireman killed, the baggage-master badly, the engineman and a passenger slightly hurt.

On the 17th as two freight trains on the Cleveland, Columbus, Cincinnati & Indianapolis road were going up a long grade near Versailles, O., seven cars broke loose from the forward train and ran back into the head of the following one. The engine and cars were wrecked, two drovers, who were in the caboose, killed and a brakeman badly hurt.

On the 17th a passenger train on the Atlantic, Mississippi & Ohio road ran off the track near Burkeville, Va., damaging the engine badly.

On the evening of the 17th a freight train on the Missouri Pacific road was thrown from the track near Independence, Mo., by a broken rail, wrecking several cars, killing one brakeman and injuring another.

Very early on the morning of the 18th a special train on the West Jersey road ran into a wash-out near Camden, N. J., wrecking the engine and injuring the engineman.

Early on the morning of the 18th a passenger train on the Newark & Elizabeth Branch of the Central Railroad of New Jersey ran into a wash-out near Newark, N. J. The engine and all the cars left the track, the engine being half buried in the mud and the cars badly damaged. Two passengers were hurt.

On the morning of the 18th a freight train on the Port Royal Railroad was thrown from the track and wrecked at Jackson, S. C., where some rails had been removed by a party of rioters.

On the morning of the 18th, as a freight train on the Central Pacific road was approaching the pile bridge over Tom Paine's Slough, near Banta, Cal., the second car was thrown from the track by a brake beam, which fell from its place upon the rails. The car ran upon the bridge upon the ties and tore down some 50 feet of it, going down into the water, and the twelve following cars were dragged after it and fell on top of it, filling up the gap in the bridge with a very bad wreck. The engine and first car passed over safely and the caboose at the rear end of the train also remained on the track. Two tramps, who were stealing a ride, were killed.

On the 18th two cars of a freight train on the Lafayette, Muncie & Bloomington road ran off the track near Frankfort, Ind.

On the evening of the 18th the engine and three cars of a freight train on the Chicago, Rock Island & Pacific road were thrown from the track and wrecked near Joliet, Ill., by a switch which had been purposely misplaced. The engineman was slightly hurt.

Early on the morning of the 19th as a coal train on the Philadelphia & Reading road was backing down the track at Swede's Ford, Pa., two cars were thrown from the track by a misplaced switch, killing a brakeman.

On the morning of the 19th, the second section of a south bound freight train on the Louisville & Nashville road ran into the rear of the first section, which had stopped to take water at Bardstown Junction, Ky., wrecking the engine and seven cars and blocking the road some hours.

On the 19th, the engine of a train on the Chicago, Milwaukee & St. Paul was thrown from the track and slightly damaged by a rail which somebody had laid across the track at Whitewater, Wis.

On the night of the 19th, a drunken wiper took possession of an engine which was standing in the St. Louis, Keokuk & Northwestern yard at Alexandria, Mo., and started down the road. He had not gone far when the engine ran into a flat car, wrecking it and damaging itself somewhat.

Early on the morning of the 20th, the engine and four cars of an express train on the Canada Southern road were thrown from the track on a high embankment near Tilsonburg, Ont., where somebody had taken out the fastenings of a rail and hained it back out of position. The engine and cars were badly broken, and the brakeman so hurt that he died the next day.

Early on the morning of the 20th, a freight train on the Atlantic & Great Western road ran into the rear of a preceding freight near Corry, Pa., damaging the engine, wrecking two cars, injuring the fireman and blocking the road half a day. There was a thick fog at the time.

On the afternoon of the 20th, there was a butting collision between a freight and a construction train on the Burlington, Cedar Rapids & Northern road, near Burlington, Ia., by which both engines and four cars were badly broken, the fireman of the freight killed and the engineman so hurt that he died the same night.

On the evening of the 20th, a mixed train on the Valley Branch of the Baltimore & Ohio road struck a bull near Strasburg, Va., and the engine and four freight cars were thrown from the track and badly broken.

On the morning of the 21st a sleeping car of a train on the Nashville, Chattanooga & St. Louis road was thrown from the track and wrecked near Hickman, Ky., injuring five passengers.

On the 21st a freight train on the Chesapeake & Ohio road broke in two near Green Springs, Va., and the rear section afterwards ran into the first, wrecking 13 cars and injuring two brakemen.

On the afternoon of the 21st four cars of a freight train on the Missouri Pacific road were thrown from the track by the spreading of the rails on a curve near Leavenworth, Kan. The road was blocked all night.

Early on the morning of the 22d a train on the Pittsburgh, Cincinnati & St. Louis road ran off the track on a high bank near Black Lick, O. The engine and first two cars remained on the track, but the rest of the train went down the bank, the cars being piled up together in a very bad wreck, some of them being completely destroyed. Four passengers were killed, three fatally hurt, 27 seriously injured and a number slightly bruised. The train was long and was crowded with passengers returning from the Centennial. After a careful investigation it was decided that the cause of the accident was the breaking of an axle (burned off at the journal) under the first passenger car.

On the morning of the 22d there was a butting collision between a Toledo, Peoria & Warsaw passenger and a Toledo, Wabash & Western freight on the track used by both roads, near Elvaston, Ia. The Wabash freight had been stalled on a grade near Hamilton, and the Peoria train was ordered at Elvaston to run to Hamilton, flagging the freight. Meantime, however, the freight had started and was running too fast to stop in time when it met the flag. Both engines were damaged and a passenger slightly hurt.

On the morning of the 22d a possenger train on the North Pennsylvania road ran into the head of a coal train which was just going up a siding at Sellersville, Pa., damaging an engine and two cars, killing a tramp who was stealing a ride and injuring two passengers slightly.

On the morning of the 22d as a freight engine on the Lehigh Valley road was standing on the track at White Haven, Pa., while the engineman and fireman got their breakfast, the throttle valve was opened in some unexplained way and the engine started off alone. After running several miles it ran into the head of a coal train, wrecking both engines and several cars and blocking the road some time.

On the 22d the boiler of the engine of a freight train on the Memphis & Charleston road exploded while the train was near Grand Junction, Tenn. The engine was demolished, several cars badly broken, the engineman killed and the fireman hurt.

On the afternoon of the 22d the caboose of a way freight train on the Erie Railway caught fire when the train was near Pond Eddy, Pa., and was entirely destroyed.

On the afternoon of the 22d a Chicago & Alton freight train ran into a Pekin, Lincoln & Decatur freight at the crossing of the two roads in Delavan, Ill., throwing the Pekin engine over on its side, damaging it badly and injuring the engineman.

On the evening of the 22d a passenger train on the Michigan Central road ran into the rear of a freight which was stalled on a heavy grade near Three Oaks, Mich., wrecking several cars. The engineman and fireman of the passenger both jumped and were hurt. The freight conductor claimed that the passenger train was following him so closely that there was no time to send back a signal.

On the 23d a sleeping car of a train on the St. Louis & Southeastern road ran off the track near Madisonville, Ky.

On the morning of the 24th an extra train of empty passenger cars was thrown from the track by a wash-out at Iron Hill, Del., on the Philadelphia, Wilmington & Baltimore road. The engine and three cars were damaged.

On the morning of the 24th, on the Cleveland, Columbus, Cincinnati & Indianapolis road, in Indianapolis, Ind., there was a butting collision between a passenger and a freight train by which both engines and a freight car were damaged.

On the night of the 24th a freight train on the Atlantic & North Carolina road ran into a gap where a culvert had been washed out near Goldsboro, N. C., and was badly wrecked.

On the morning of the 25th a car of a freight train on the Erie Railway ran off the track at Ridgewood, N. J., delaying trains some time.

On the 25th a passenger train on the St. Louis and Southeastern road was thrown from the track by the spreading of the rails near Hendersonville, Ky. The engine was badly damaged.

On the afternoon of the 25th a south-bound train on the North Pennsylvania road ran into the head of a north-bound local train which was just backing into a siding at Abington, Pa. The engineman of the south-bound train jumped and was hurt.

On the evening of the 25th, on the Montpelier & Wells River track in Montpelier, Vt., there was a butting collision between a Wells River mixed train and a passenger train of the Montpelier & White River road. Both engines and several cars were damaged and the engineman of the White River train was fatally hurt. The accident was caused by a misplaced switch.

On the night of the 26th a freight train on the Pittsburgh, Cincinnati & St. Louis road ran over a misplaced switch and into the rear of a passenger train standing on a siding at Richmond, Ind. The engineman jumped and was badly hurt.

On the afternoon of the 27th, as a passenger train on the Utica & Black River road was approaching the Snugsboro cut, near Lyons Falls, N. Y., the engine struck a horse, which ran upon the track immediately in front of it. The engine left the track and ran down the bank, turning over on its side at the bottom. The baggage and one passenger car left the track also, but remained on the ties, the coupling of the tender having broken. The engineman and fireman were badly bruised and cut.

On the afternoon of the 27th a train on the Lake Shore & Michigan Southern road ran off the track near Ashtabula, O., at a place where some trackmen had taken out a rail for repairs and failed to put out a signal in time.

On the night of the 27th a freight train on the New Jersey Division of the Lehigh Valley road ran over some horses near Neshanic, N. J., and a car was thrown from the track and wrecked.

On the morning of the 28th two cars of a freight train on the Metropolitan Branch of the Baltimore & Ohio were thrown from the track by a broken wheel near Point of Rocks, Md., blocking the road several hours.

On the morning of the 28th, as an express train on the Erie Railway was entering the yard at Salamanca, N. Y., it ran over a misplaced switch and into the rear of a coal train standing on a siding. The engine and several cars were wrecked and the fireman hurt.

On the afternoon of the 28th a passenger train on the Portland & Ogdensburg road struck a cow on the track near Cumberland, Me., and the engine was thrown from the track and badly wrecked, the engineman being severely scalded.

On the evening of the 28th three cars of a freight train on the Providence & Worcester road ran off the track in Valley Falls, R. I., blocking the track all night.

On the night of the 28th a special train on the Rensselaer & Saratoga road, having a political club on board, was thrown from the track by a misplaced switch near Ballston, N. Y. The switch is said to have been purposely set wrong.

Very early on the morning of the 29th a freight train on the Pennsylvania Railroad ran into the rear of a preceding freight at Holmesburg Junction, Pa., damaging the engine and caboose and injuring a brakeman.

Very early on the morning of the 29th three cars of a freight train on the Pennsylvania Railroad ran off the track near East Newark, N. J., delaying trains three hours.

On the 29th six cars of a freight train on the St. Louis & Southeastern road were thrown from the track and wrecked near Madisonville, Ky., by the spreading of the rails.

On the afternoon of the 29th, as a passenger train on the Keokuk & Des Moines road was crossing a trestle at Yellow Banks, Ia., one of the driving axles broke close to the hub of the wheel. The wheel ran off to one side of the road, leaving the engine on the track.

Early on the morning of the 30th a coal train on the New York Central & Hudson River broke in two near Pittsford, N. Y., and the rear section afterwards ran into the forward one, wrecking three coal dumps.

On the afternoon of the 30th a mixed train on the Anderson, Lebanon & St. Louis road ran over a cow near Anderson, Ind., throwing the engine and several freight cars from the track.

On the afternoon of the 30th a coal car broke loose on a high siding on the Baltimore & Ohio road, in Baltimore, and ran down upon the main track just in front of a passenger train. The passenger train struck and wrecked it, damaging the engine slightly.

On the evening of the 30th a train on the Western & Atlantic road was thrown from the track near Chattanooga, Tenn., by a switch which had been purposely misplaced. The engine and tender were nearly upset and the engineman and fireman slightly hurt.

This is a total of 106 accidents, whereby 41 persons were killed and 133 injured. Twenty-three accidents caused the death of one or more persons, 25 caused injury but not death, while 58 or 54.7 per cent. of the whole resulted in no injury serious enough to be recorded.

These accidents may be classified as to their nature and causes as follows:

| | | |
|---|---|---|
| COLLISIONS: | | |
| Rear collisions | 20 | |
| Butting collisions | 14 | |
| Crossing collisions | 2 | |
| Unexplained | 1 | |
| | | — 37 |
| DERAILMENTS: | | |
| Unexplained | 14 | |
| Cattle on track | 9 | |
| Wash-out | 8 | |
| Misplaced switch | 7 | |
| Spreading of rails | 5 | |
| Broken rail | 4 | |
| Broken wheel | 3 | |
| Broken axle | 2 | |
| Accidental obstruction | 3 | |
| Rail removed purposely | 2 | |
| Rail removed for repairs | 1 | |
| Malicious obstruction | 1 | |
| Broken switch | 1 | |
| Broken bridge | 1 | |
| Landslide | 1 | |
| Running off end of siding | 1 | |
| | | — 63 |
| Boiler exploded | 3 | |
| Cylinder head blown out | 1 | |
| Car burned while running | 1 | |
| Broken axle not causing derailment | 1 | |
| Total | | 106 |

Five collisions were caused by fog, four by trains breaking in two, three by mistakes in or failure to give orders, three by misplaced switches, two by runaway engines and one by a car running out of a siding. Five switches were purposely misplaced, making eight cases of train wrecking in all. The broken bridge recorded failed on account of the washing of the abutments. Twenty-eight accidents are traced directly to defect or failure of road or equipment.

As compared with September, 1875, there is a decrease of 10 in the number of accidents, of 9 in that of killed and and of 49 in that of injured. September would seem to be an unusually dangerous month.

The number of accidents is large, much above the average and the highest recorded for the year, with one exception. The number of killed and injured is also greater than in any month for a year past. Collisions are in unusual proportion, especially butting collisions, and the accounts indicate a want of care in using and looking out for signals. The number occurring during fogs seem to indicate that torpedo signals are not in such general use as they should be. It is noticeable that the method of train-wrecking is growing gradually more scientific, if the word can be so used. The wrecker no longer makes a clumsy pile of ties or puts a rail across the track; he misplaces a switch, carefully removing a pin so that the signal remains unchanged, or he removes a fish-plate and fastens the end of a rail out of place. The railroad has its revenge, perhaps, for the number of "tramps, who were stealing a ride," recorded as killed or injured is quite considerable.

For the year ending with September the record is as follows:

| | No. of accidents. | Killed. | Injured. |
|---|---|---|---|
| October | 88 | 12 | 74 |
| November | 87 | 24 | 97 |
| December | 84 | 12 | 45 |
| January | 60 | 8 | 29 |
| February | 91 | 15 | 68 |
| March | 109 | 30 | 96 |
| April | 56 | 6 | 47 |
| May | 64 | 13 | 116 |
| June | 52 | 19 | 73 |
| July | 79 | 17 | 69 |
| August | 78 | 22 | 76 |
| September | 106 | 41 | 133 |
| Totals | 954 | 219 | 900 |

The averages per day for the month were 3.53 accidents, 1.37 killed and 4.43 injured; for the year they were 2.61 accidents, 0.60 killed and 2.57 injured. The averages for the month are thus all much above those for the year. The average casualties per accident for the month were 0.387 killed and 1.255 injured; for the year they were 0.230 killed and 0.984 injured.